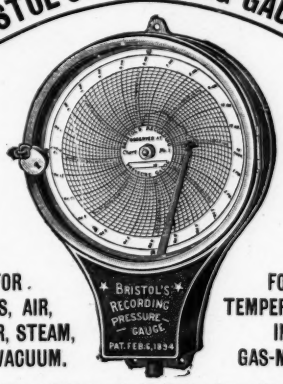
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVII. No. 1974.] LONDON, MARCH 12, 1901. [53RD YEAR. PRICE 6d.

The Latest and Well-Known
TRANSPORTABLE
AUTOMATIC
GAS-LIGHTERS, BURNERS, AND MANTLES
(*NOT INFRINGEMENTS*).
OBERFELT & CO., Berlin, Sandmannshof.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
GAS ENGINEERS' AGENTS AND CONTRACTORS FOR
Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

BRISTOL'S RECORDING GAUGES



FOR GAS, AIR, WATER, STEAM, OR VACUUM.
FOR TEMPERATURE IN GAS-MAINS.
Many Thousands in Daily Operation.
J. W. & C. J. PHILLIPS,
23, COLLEGE HILL,
LONDON, E.C.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT.
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

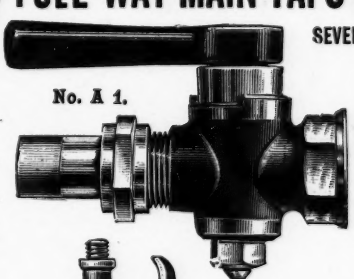
ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

Wrought-Iron TUBES
And Fittings and Accessories.
LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Ltd., Short St., LAMBETH.

BIGGS, WALL, & CO.,
GAS AND WATER ENGINEERS,
13, CROSS STREET, FINSBURY PAVEMENT,
LONDON, E.C.

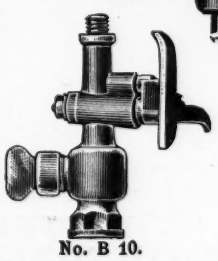
WRITE FOR OUR **PRICE LISTS** OF
FULL-WAY MAIN TAPS & LANTERN TAPS.
SEVERAL DESIGNS SHOWN BELOW.

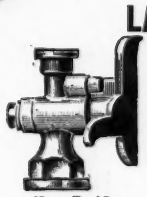
No. A.

No. A 1.


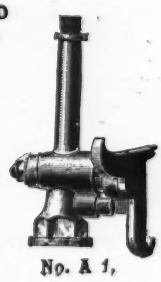
THESE TAPS ARE
FULL-WAY
AS SHOWN.
SUPERIOR QUALITY AND FINISH IN GUN METAL.

LANTERN TAPS.


No. B 10.


No. A 13.

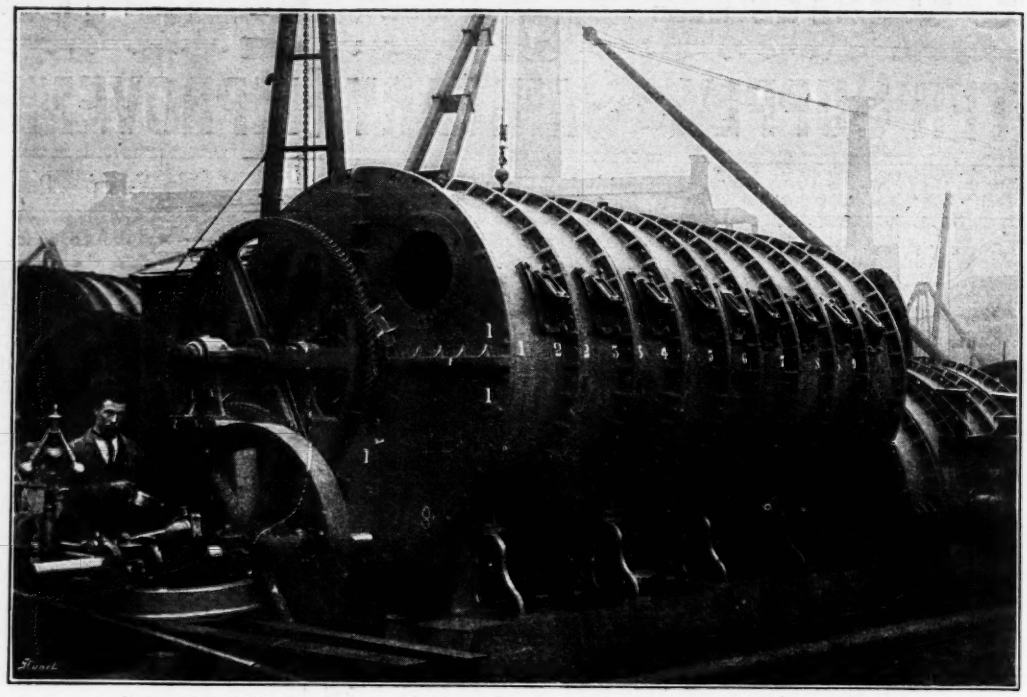
No. A 12.


No. A 1.

The "DEMAND" REGISTERED *
* Specially constructed for New Incandescent Burner.

PATENT "NEW" SCRUBBER-WASHER

All Sizes from 50,000 to 5,000,000 Cubic Feet of Gas per Day.



The "NEW" Scrubber-Washer can be arranged to suit all cases of the Washing of Gases with Liquids.

NOTE:—Orders received in **1900** for **MACHINES** to deal with **42,450,000** Cubic Feet of Gas per Diem.

PATENTEES AND SOLE MAKERS: **W. C. HOLMES & CO.**, WORKS: **HUDDERSFIELD.**

Telegrams: "HOLMES, HUDDERSFIELD." Contractors to Her Majesty's Government. Cablegram: "IGNITOR, LONDON."

R. LAIDLAW & SON

ENGINEERS & IRONFOUNDERS.

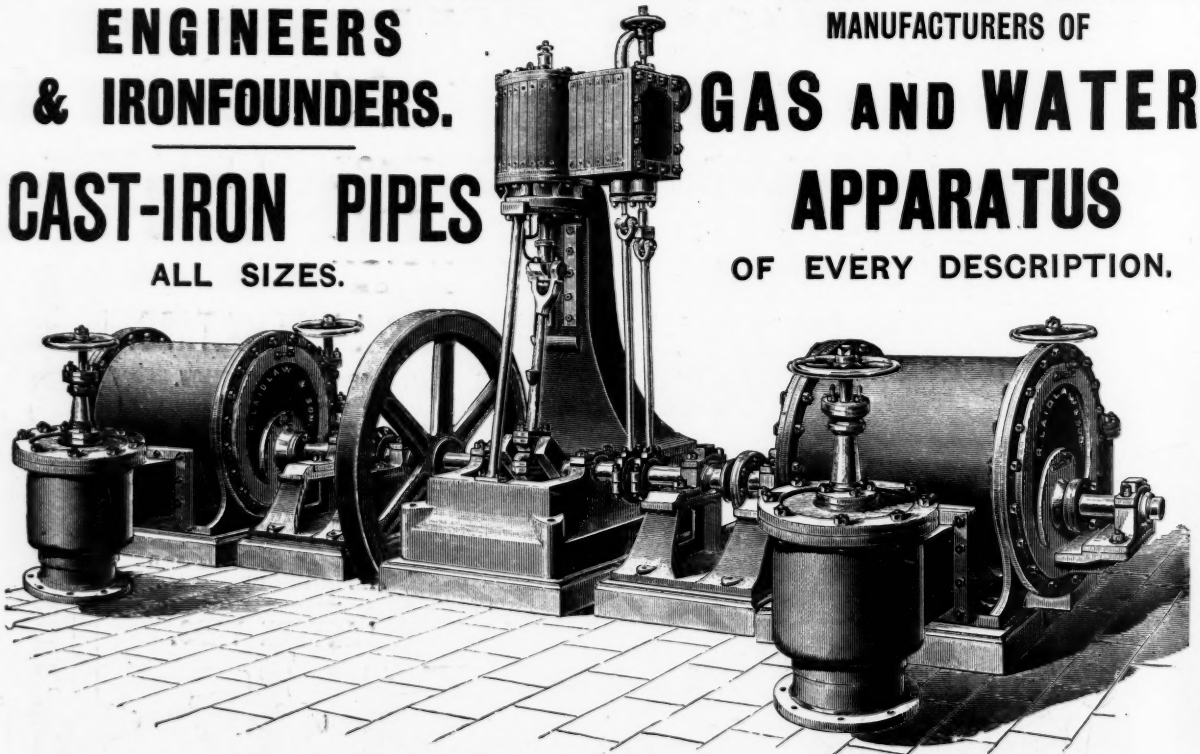
MANUFACTURERS OF

GAS AND WATER APPARATUS

OF EVERY DESCRIPTION.

CAST-IRON PIPES

ALL SIZES.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED—ALL SIZES.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

THE BARROWFIELD IRON-WORKS, LIMITED,

Late LAIDLAW, SONS, & CAINE, Limited,

GAS ENGINEERS AND CONTRACTORS,

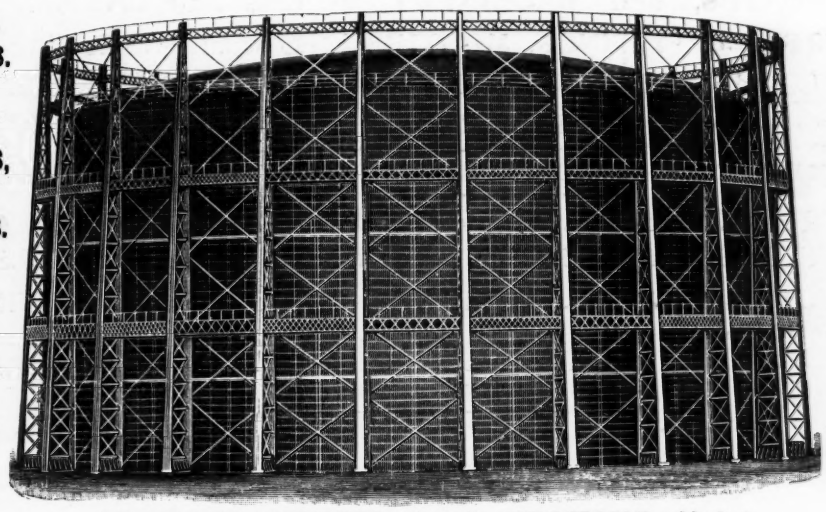
Telegrams: "GASOMETER GLASGOW." GLASGOW.

OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS, WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.



GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.

THREE-LIFT GASHOLDER. Capacity, SIX MILLION cubic feet.
240 feet Diameter by 45 feet Deep each Lift. Erected at Glasgow, 1893.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

GEORGE ORME & CO. (Branch of Meters Ltd.)

Atlas Meter Works, PARK STREET, OLDHAM.

Telegraphic Address: "ORME, OLDHAM." Telephone No. 93, OLDHAM.

NEW CENTURY PATTERN

Patent Coin *Prepayment Gas-Meters*

Fitted with Detachable Attachments. Arranged for 1d., 1s., or any other Coin desired.

Dry Meter in Tin-Plate Case, fitted with Attachment.

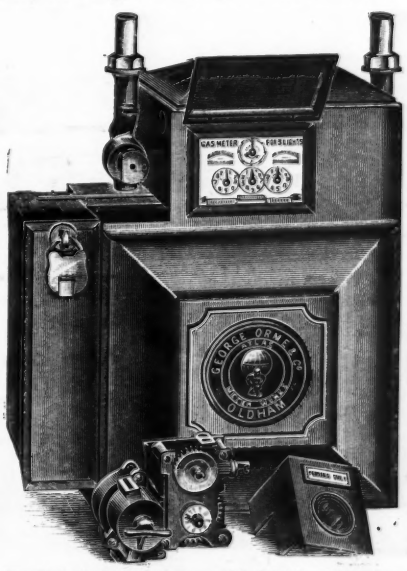
Price changed *in situ* by means of one Crown Wheel only.

COMPACT.

DURABLE.

RELIABLE.

SIMPLE.



Dry Meter in Tin-Plate Case, with Attachment removed.

Any further Particulars will be supplied upon Application.

NEWTON, CHAMBERS, & CO.,

LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

Established 1790

LONDON OFFICE: 19, Great George Street, WESTMINSTER.

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS.

Manufacturers of every description of

PLANT, APPARATUS, and MACHINERY for GAS and CHEMICAL WORKS.

RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

CONDENSERS, SCRUBBERS, and WASHERS.

PURIFIERS with Planed Joints a Speciality.

Patent CENTRE-VALVES, RACK and SCREW VALVES, WOOD GRIDS, and SCRUBBER-BOARDS, CAST-IRON MAINS, and SPECIALS.

STRUCTURAL WORK, COLUMNS, GIRDERS, and ROOFING.

GASHOLDERS, Cast-Iron or Steel Tanks.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (Special Quality) for Engine Cylinders, GAS COAL famous for its UNRIVALLED EXCELLENCE.

THE WIGAN COAL & IRON CO., LIMTD.,

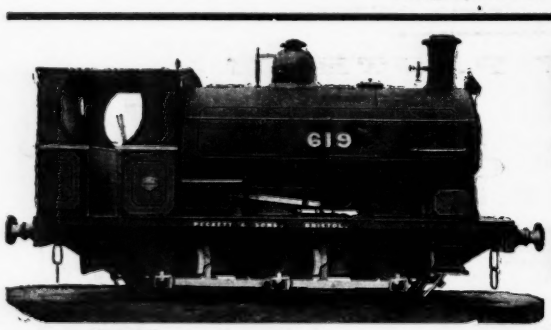
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland and West of England District Office: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

Telegraphic Address: "PARKER, LONDON."



LOCOMOTIVES

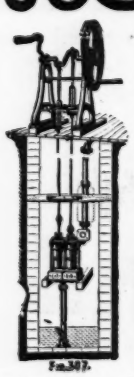
LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for Immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT BRISTOL."

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

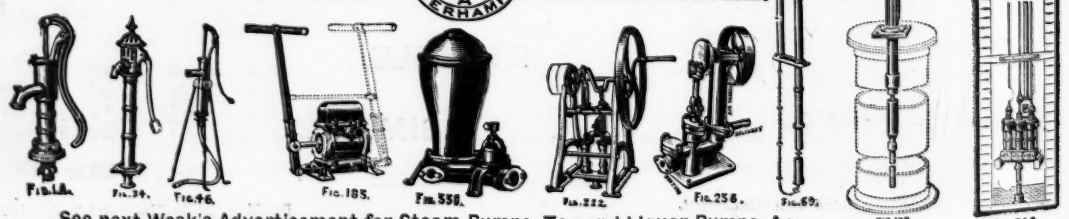


PLEASE APPLY FOR CATALOGUE No. 8.

TRADE MARK.

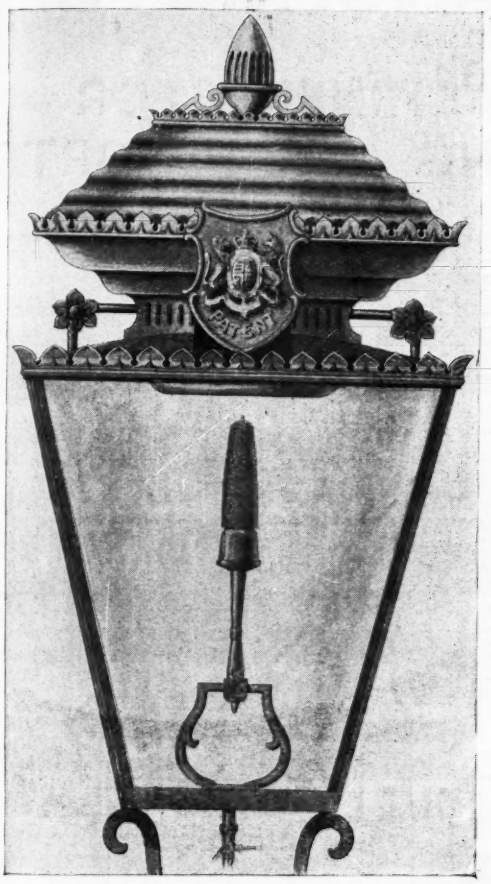
FIRST AWARDS EVERYWHERE.

Telegrams: "EVANS, WOLVERHAMPTON." National Telephone No. 7039.



See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

SCOTT-SNELL
SELF-INTENSIFYING LAMP.



SIZE NORMAL.

Automatic Action.

No Complex Mechanism.

"Power" Free of Cost.

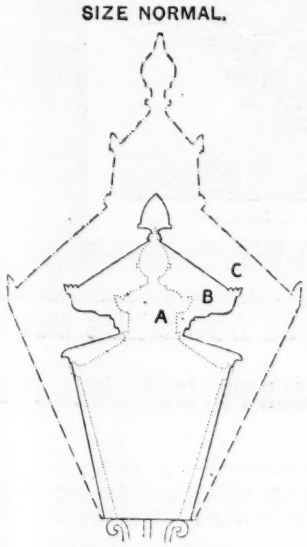
INTENSIFIED LIGHT

WITHOUT Compressing Plant, Special Gas-Service, Water Bill, Gas-Engine or other Pumping Appliances, tearing up of Roadways, or interference with existing Service.

The **SCOTT-SNELL LAMP** may be set to give any pressure from 4 inches to 36 inches of Water; 8 inches to 10 inches is usually preferred.

400-*CANDLE POWER OBTAINED FROM A SINGLE BURNER.*

Lanterns supplied with Single, Duplex, or Cluster of Burners.



SCALE DIAGRAM.
A. Ordinary 16-inch Street Lamp.
B. Scott-Snell Self-Intensifying Lamp.
C. Ordinary Refuge Lamp.

HIGH-PRESSURE LIGHTING HAS COME TO STAY.

Orders for Trial Lamps will, as far as possible, be executed in rotation.

The Lamps are being made by Automatic Machinery, similar parts interchangeable, minimum of hand labour.

THE LAMPS MAY BE INSPECTED AT ANY TIME BY APPOINTMENT.

THE SCOTT-SNELL SELF-INTENSIFYING GAS-LAMP COMPANY, LTD.,

Telephone No. 559 Westminster.
Works: 29, GILLINGHAM STREET, S.W.

53, Victoria Street,
WESTMINSTER, S.W.

WEST'S GAS IMPROVEMENT CO., LTD.,

ALBION IRON-WORKS, MILES PLATTING,

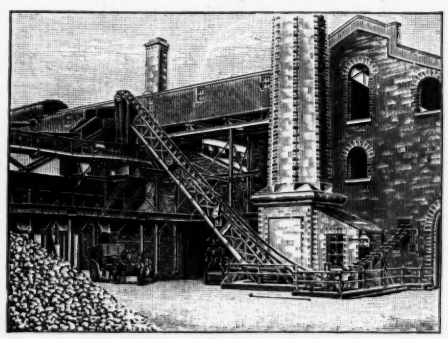
And 104, QUEEN VICTORIA STREET, LONDON, E.C. **MANCHESTER.**

SOLE MAKERS OF

WEST'S STOKING MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

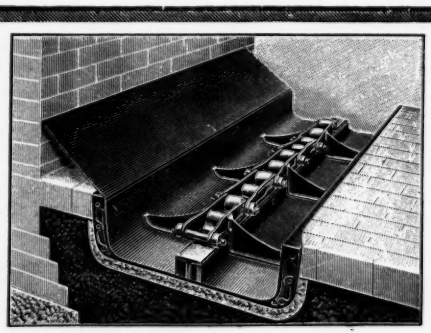
ALSO

WEST'S PATENT SILENT COKE CONVEYOR



VIEW SHEWING END OF COKE CONVEYOR, ELEVATOR AND CONVEYOR FOR STORING COKE IN HOPPERS AND COKE YARD.

INTERIOR OF RETORT HOUSE SHEWING COKE CONVEYOR.



SECTION OF COKE CONVEYOR.

Silent in Action. Simple Wearing Parts. Does not make Breeze.

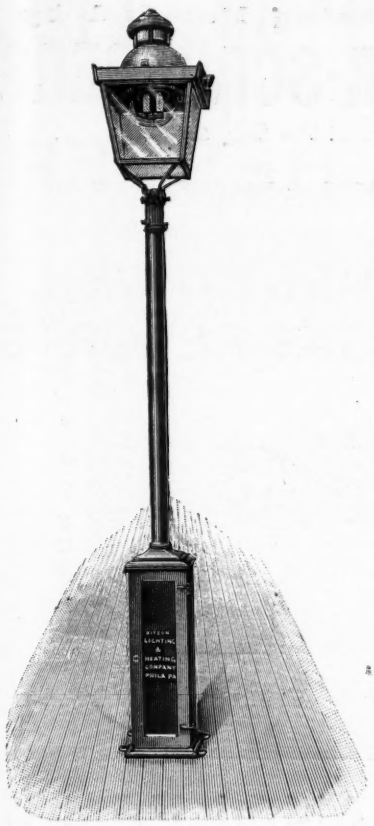
SPECIALLY ADAPTED FOR CONVEYING, ELEVATING, AND STACKING HOT COKE FROM GAS-RETORTS OR COKE-OVENS.

The Conveyor after leaving the Retort-House may be arranged to rise up an incline to any required height, and the Coke delivered from the Conveyor to the Coke-Store from any part of the Conveyor.

ALSO MAKERS OF

West's Coke Breaking, Sorting, Sizing, and Screening Machinery.
West's Patent Inclined and Horizontal Regenerator Settings.
Coal-Handling Machinery for Gas and Electric Light Works.

GAS AND GENERAL ENGINEERS.



THE

"KITSON" OIL LIGHT

(VAPORIZED PETROLEUM BURNT WITHIN A MANTLE.)

1200-Candle Power, 1d. per Hour!!!

For Streets, Stations, Yards, Factories, &c., &c.

A System of Lighting surpassing all others in respect of

EFFICIENCY AND ECONOMY.

Self-contained Lamp-Posts.

No tearing up of the Thoroughfares.

See Professor Lewes and Dr. Boverton Redwood's Joint Report.

("JOURNAL," *Feb. 5, p. 338.*)

KITSON LIGHTING AND HEATING SYNDICATE, LIMITED,

BLACKFRIARS, LONDON, E.C.

Telephone No. 103. Telegraphic Address: "ELEVATOR, HASLINGDEN."

S. S. STOTT & CO.,

ENGINEERS, HASLINGDEN, NR. MANCHESTER.

COAL AND COKE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

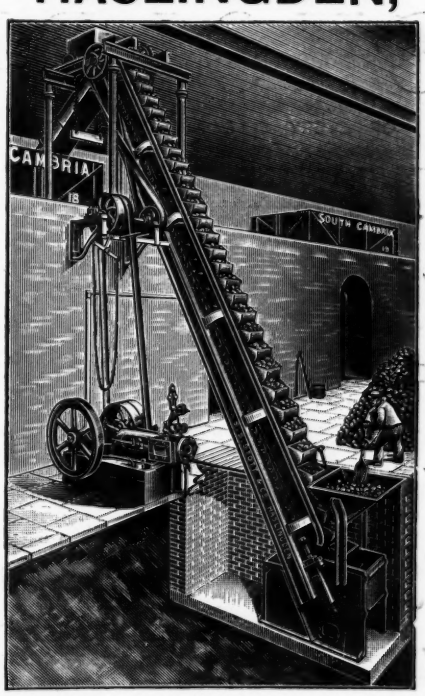
COAL AND COKE BREAKERS.

WHARF ELEVATORS FOR UNLOADING BARGES.

ELEVATORS & CONVEYORS for BOILER-HOUSES.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.



Coke Elevator Loading Railway Waggons.

LIME AND OXIDE ELEVATORS & CONVEYORS.

HIGH-CLASS STEAM-ENGINES up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

AIR-COMPRESSORS.

BELT PULLEYS, ROPE PULLEYS, GEARING, &c., &c.

642,000,000

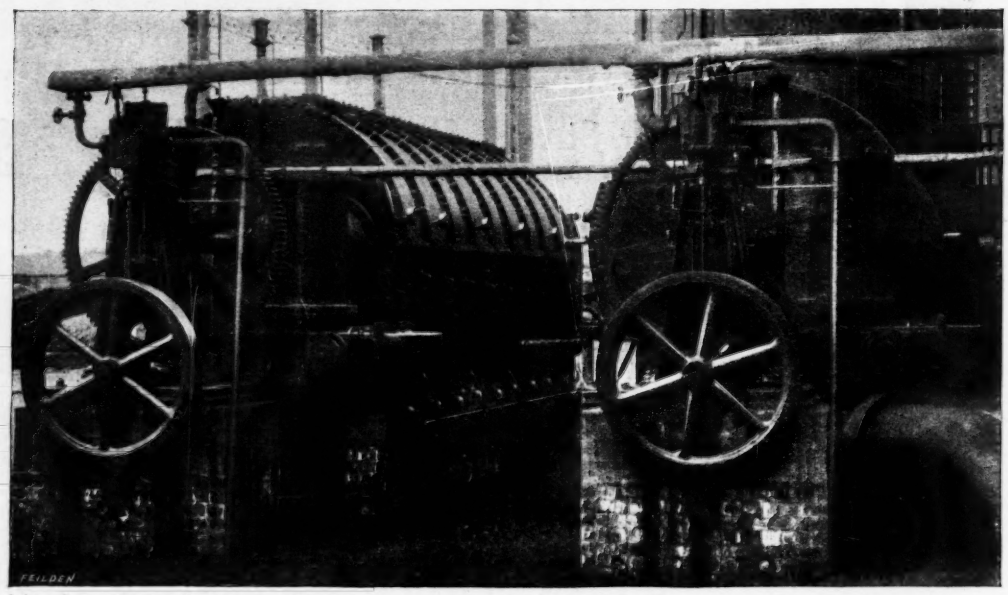
Cubic Feet of Gas per day are now being Purified by

PATENT "STANDARD" WASHER-SCRUBBERS

which extract ALL the Ammonia and a large proportion of the CO_2 and H_2S.

Prevention of Slip of Gas Unwashed.

Strength of Liquor Concentrated.



Maximum Washing Surface.

Easy access to interior.

KIRKHAM, HULETT, & CHANDLER, LD.

PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

S. CUTLER AND SONS, MILLWALL, LONDON.

GASHOLDERS

OF EVERY SIZE AND DESCRIPTION

CUTLER'S PATENT GUIDE-FRAMING

HAS BEEN ADOPTED FOR MANY IMPORTANT HOLDERS.

Carburetted Water-Gas Plant.

SPECIAL DESCRIPTIVE CATALOGUE ON APPLICATION.

PATENT WATER-TUBE CONDENSER

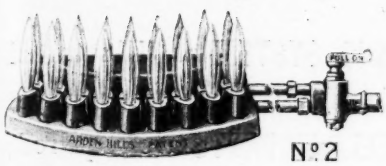
Over 120 now in use.

Cutler's Patent Freezing Preventer

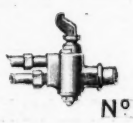
For keeping Cups of Gasholders free from Ice.

CHARLES HUNT PATENT GAS-WASHER.

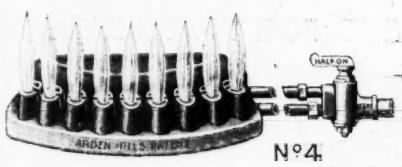
No. 1.



No. 2.



No. 3.



No. 4.

No. 1. Tap off.
No. 2. Burner and Tap full on.
No. 3. Showing position of Lever in Tap when three quarter on.
No. 4. Burner and Tap half on.

A NATIONAL ECONOMIZER.

THIS IS THE

PATENT "ACME" DUAL BURNER AND TRIPLEX TAP,

WHICH IS FITTED IN

ARDEN HILL & CO.'S GAS-FIRES.

CHIEF ADVANTAGES.

1. Consumption of Gas reduced 50 per cent.
2. When half on, same appearance as full on.
3. Burner does not flash back when re-lighting.

The LEEDS FIRECLAY CO., LD., WORTLEY, LEEDS.

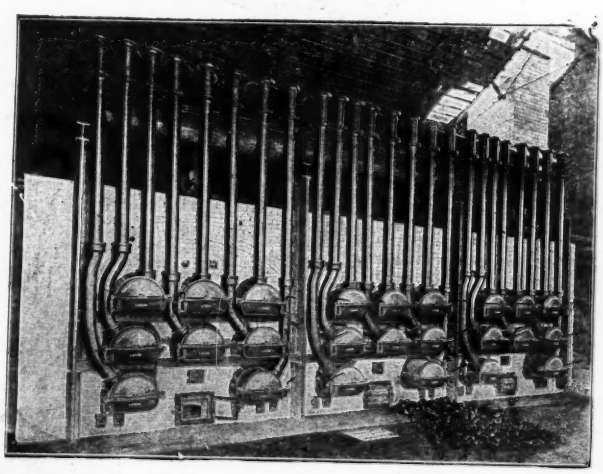
Telegrams: "SETTINGS, LEEDS." Telephone: No. 1332.

ENGINEERING DEPARTMENT

RETORT

INCLINED,
HORIZONTAL,
REGENERATOR,
GENERATOR,
AND
DIRECT FIRED.

RETORTS RE-SET.



SETTINGS

SHALLOW REGENERATORS A SPECIALITY.

NUMEROUS TESTIMONIALS.

GUARANTEED RESULTS EXCEEDED IN MOST INSTANCES.

SOLE MAKERS OF HUDSON & RANN'S PATENT AUTOMATIC CHIMNEY DRAUGHT REGULATOR.

MOUTHPIECES, WITH SELF-SEALING OR LUTED LIDS.

BENCH, FURNACE, AND FLOOR IRONWORK ROOFS

CONDENSERS, WASHERS, SCRUBBERS.
PURIFIERS, GASHOLDERS, &c.

COAL & COKE BREAKING, ELEVATING, & CONVEYING MACHINERY.

— CONTRACTORS FOR COMPLETE GAS-WORKS. —

1st. Take out Seal Screw and remove Handle.

PREPAYMENT METERS

Price Changing *in Situ.*

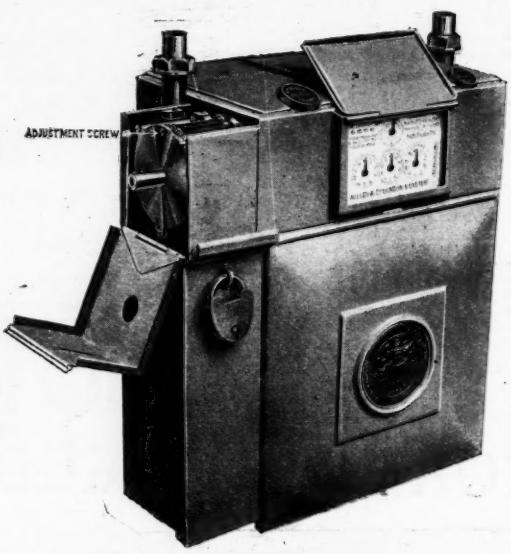
OUR PRICE-CHANGING SYSTEM as Illustrated is the simplest, quickest, and most accurate yet devised. **NO NEW WHEELS OR PARTS** are required; and the arrangement is entirely covered over and sealed.

ALL PARTS INTERCHANGEABLE.

GUARANTEED FOR FIVE YEARS.

Cannot be tampered with through the Slot.

Slot closed when maximum number of coins are inserted.



Tens of Thousands in use and adopted exclusively by many Gas Companies.

2nd. Swing over Cover and remove Adjustment Screw.

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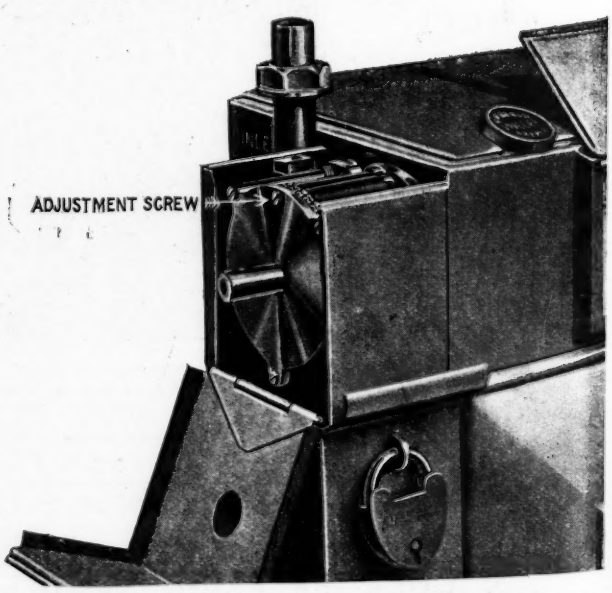

3rd. Turn loose Ring until number of feet required is opposite arrow, replace Adjustment Screw and Re-seal.

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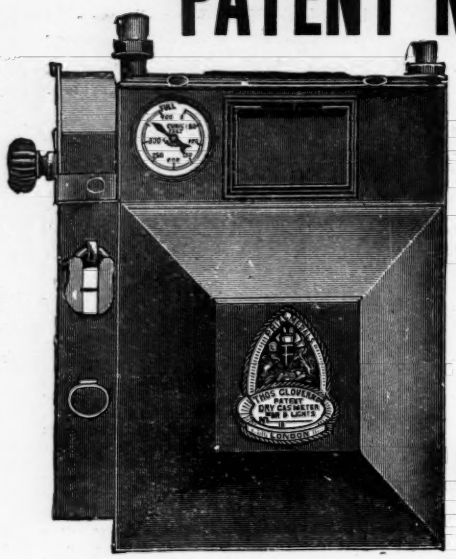

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

VOL. LXXVII., No. 1974.——TUESDAY, MARCH 12, 1901.

EDITORIAL NOTES.

The Position in the Coal Trade.

For the first time for many a long month, the Board of Trade returns show a heavy falling off in the exports of fuel. The total quantity of coal, coke, and patent fuel shipped in the month of February was only 3,694,500 tons, as compared with 4,231,453 tons in the same month of 1900, and 4,096,672 tons in 1899. A reduction of over half-a-million tons in four weeks is a very substantial and satisfactory figure; and if, as appears likely, the succeeding months show similar decreases, the effect upon the coal market in this country will be strongly marked. The falling off is very general (the only countries taking increased quantities being Italy, Spain, and Malta); while the decrease is greatest in the cases of France and Germany. There is, indeed, a very widespread slackening of trade on the Continent, as well as in this country; the industrial position being particularly unsatisfactory in Germany. There is a serious growth of the margin of unemployed labour, numbers of the enterprises floated during the recent era of trade activity are showing their lack of stable foundation; and fears of a period of serious depression are entertained in high quarters. In France and Russia, also, trade is by no means satisfactory, business having been everywhere crippled by the season of high prices from which we are only now slowly emerging.

This state of business abroad finds ample confirmation in the export returns of the last two months in regard to iron and steel goods as well as coal. The total weight of these commodities exported shows a falling off of 92,274 tons, or 30 per cent., in February; making a reduction of 218,371 tons, or 33 per cent., since the beginning of the year. This represents a lessened consumption of coal to the tune of over 500,000 tons. So that, taking into account the falling off in the exports of coal as such, the outward trade of the past two months has drawn upon the coal market of this country to the extent of about a million tons less than in 1900. When the diminished volume of trade done in the home markets and the displacement of home-made by imported iron and steel (a matter of 52,627 tons in the two months) are also taken into account, no surprise can be felt at the very different condition of the coal business to-day from what it was twelve months since, and throughout the great part of last year.

And what of the future? In some quarters there is a disposition to prophesy a revival in the iron and engineering trades in this country; but we fail to see any prospect of anything in the nature of a return to the conditions prevailing in 1899 and the first half of 1900. From the present state of trade, there must, it is true, be some degree of recovery, otherwise the outlook would indeed be threatening of calamity for the iron and steel trades. But that such recovery will be experienced except as the outcome of a further reduction in prices, seems very doubtful. There is a fair number of orders being kept back by consumers, undoubtedly; but buyers will need a great deal more evidence than is at present forthcoming to persuade them that the time has arrived to put those orders on the market. Hand-to-mouth buying is still the order of the day in all quarters affected by the price of coal; and before any substantial revival can be looked for by the iron and steel makers, coal has to come down further—and there is every indication that it will.

Gas coal is already down about 6s. 6d. or 7s. per ton from the contract prices of last year—a very welcome reduction, even if no further concession could be obtained, or rather wrung, by means of the leverage of competition, from the collieries. It must not be—it is not likely to be—forgotten hat this reduction still leaves prices at least 3s. a ton above the level of normal years; and whatever difficulties may lie n the way of coalowners taking less than current prices for future contracts, they can expect no sympathy and no mercy from the gas industry, which they have bled to the uttermost during the time of their opportunity. Those who follow at all carefully the trend of the different coal markets will assuredly have noticed symptoms of strengthening in the Newcastle and district market during the last week or so. We mention it merely to point out that this firmer tone is not due to any general improvement in the coal trade, but to the fact that, prices having been lowered more rapidly in the North of England than in Scotland, shipping orders have gravitated from the Scottish ports to the Tyne and Wear. This will soon right itself by leading to further reductions in Scotland—reductions which will be facilitated by the men accepting the decreased rate of wages offered by the owners.

Taking all these factors into consideration, the situation is entirely hopeful. Some gas companies are acting upon the assumption that no better terms are to be had for the waiting—the Tynemouth Company's Chairman informed their annual meeting last Thursday that the Directors had bought from a leading Durham colliery 35,000 tons of best gas coal at 6s. 6½d. per ton less than the old contract rates, which is about the average fall in quoted prices—but we do not think there is any occasion to look upon the current rates as representing the lowest obtainable. Certainly, a waiting policy involves a minimum of risk.

The Welsbach 1893 Patent Upheld.

Last Wednesday, Mr. Justice Channell, sitting in the King's Bench Division, had before him an action brought by the Welsbach Incandescent Gas-Light Company for infringement of their 1893 patent. It will be seen by the brief report of the proceedings appearing in another column, that the plaintiffs treated this action as of cardinal importance—as indeed it was, being the first that has brought before the Court the patent for the process by which all the incandescent gas-burner mantles actually in use are manufactured. As it happened, the case was not contested, as the plaintiffs would doubtless have preferred; for defendant did not appear. Nevertheless, Mr. Fletcher Moulton, K.C., who led a formidable array of Counsel for the plaintiffs, was obliged to prove his case to the satisfaction of the Court, in order that the future position of his clients and their patent might be established. Hitherto, the position of the Welsbach Company has been anything but satisfactory in this regard; and we may even go so far as to say that the awkwardness of the situation has been shared in their degrees by all persons who have any business interest in incandescent gas lighting. Dealers in mantles of other than Welsbach make have boldly sought for custom, alleging—what is perfectly true—that the Welsbach master patent of 1885, and the covering thorium patent of 1886, are run out. They further proceeded to assert that the patent of 1893 had never been established in Court, which was also correct. Meanwhile, as no patent is infringed until infringement is proved and the validity of the patent upheld, these rivals of the Welsbach Company had their fling unchecked for a season. Now it is some satisfaction to know that this period of suspense is at an end. The Welsbach 1893 patent has occupied since last Wednesday a position which it will probably retain for the remainder of its natural life. That is the new state of affairs in regard to incandescent lighting with which the whole gas industry in these kingdoms has now to reckon. Fortunately for the interest of sellers and consumers of gas, the new Administration of the Welsbach Company has already manifested a prudent desire to do business on commercial lines; and if the Company are to be relieved from the burden of incessant litigation of the most hazardous and costly kind, which has oppressed them for so many years, it may be reasonably hoped that their customers will participate in the benefit of this relief.

In hearing the case on Wednesday, the Judge made some remarks (as modern occupants of the Bench occasionally do) on the merits of the judicial system which judges exist to carry out. He said that it is not a very satisfactory way of establishing the validity of a patent, to proceed for infringement in the absence of an opponent, and before somebody who has no scientific knowledge. It may be considered by some that this was not a very gracious reflection upon the parties who were actually in Court; nor was it a competent

criticism on the procedure in such cases by the Judge whose duty it was to administer the law as it is. The plaintiffs could reasonably complain that such observations might be misunderstood by ignorant persons outside—and especially be twisted, by such acute adventurers as they have to contend with, into a disparagement of their legal victory. The learned Judge cannot have intended his casual remarks, at the beginning of the hearing, to be so interpreted; and it may be as well to draw attention to the fact that he offered full amends afterwards by unreservedly granting the injunction and certificate as prayed. But, with all due respect be it said, this fashion of judges criticizing the law is not an admirable one. The plaintiffs in question have been in the position of a man fighting a swarm of horse-flies, individually insignificant and elusive, collectively murderous. Never in the whole history of inventions has a speciality so valuable been so easily pirated. When the Welsbach Company caught an offender he was not there, to use an Hibernicism. They thought they really had somebody in the present instance; but they only secured his pleadings. That, however, was sufficient in the circumstances. So long as English law deals with individuals on the principle of personal responsibility, it will be impossible to sort out litigants into those worthy of powder and shot and those who are not. The litigant who maintains an action through all its stages up to the trial, and then slinks off, can never be forced to go on against his will.

The other observation of the Judge referred to a quite general question, of the manner in which patent cases ought to be tried. That has nothing more to do with incandescent gas-burner litigation than it has with a question of patent right in the manufacture of bustles—a matter, by the way, which has served as the subject of a leading decision. Naturally, a Judge who tries patent cases is an unscientific person. He is not wanted to be anything more than a sound lawyer and an impartial Judge. Other people can find all the science that may be required; but nobody would trust them to give a fair judgment. It is open to anybody to propose an amendment of the law in regard to this or any other point of procedure; but it is highly inconvenient to have procedure criticized while it has to be followd by the Court and submitted to by litigants.

American Coal in Europe.

The prospect of relief for the over-strained coal market in this country last year being provided by the advent of American coal in Europe was widely canvassed during the autumn; attention being especially called to the subject by the arrival in the Thames of a cargo of Philadelphian coal consigned to the South Metropolitan Gas Company. It is therefore of interest to note the statistics of the exports of coal from the United States to Europe in 1900. The total quantity amounted to 635,237 tons, as against only 35,322 tons in 1899. The English coal market may, then, be said to have been relieved of orders to the extent of about 600,000 tons last year, by the intervention of American coal. That quantity, although only about 0·25 per cent. of the total output of Great Britain, and little more than 1¼ per cent. of our exports of coal, is sufficiently considerable to have had some influence upon so sensitive an exchange as the coal market usually is, and specially was last year. That, however, is not the full measure of the influence of American coal upon our export trade, for English coal was, to a considerable extent, displaced by American in the West Indies and the South American States. The shipments of coal from the United States to those markets increased last year by 460,000 tons. In regard to one country only—namely, Brazil—our exports for the year 1900 fell off 176,000 tons, and have fallen a further 77,000 tons during the last two months. The figures for the minor States are not yet available, but will in all probability also show decreases. It is, of course, in these more distant markets that our coal trade is most likely to suffer permanently from the competition of America; but a continuance of the importation of United States coal into Europe is not beyond the bounds of possibility, even after English coal has fallen to its normal level, should the Subsidy Bill now before Congress become law. A subsidy of something like 2s. 6d. a ton would then have to be paid upon all coal shipped to Europe; and, as schemes are afloat for constructing large-capacity colliers designed to convey coal at very low freights across the Atlantic, English consumers may have permanently the benefit of extended competition in the coal trade. There are, however, several "ifs" in the matter.

The Reformation of West Bromwich.

As will be seen by the report which we publish elsewhere, the question of the disposal of the surplus profits of the West Bromwich Corporation gas undertaking was exhaustively discussed at the meeting of the Town Council last Wednesday, on the recommendation of the Gas Committee that £2000 of their balance should be applied in aid of the district rate for the ensuing twelve months. Mr. Wilson, who is Deputy-Chairman of the Committee, introduced the recommendation in a speech of marked ability. He gave a masterly exposition of the financial circumstances of the undertaking, and concluded by moving the resolution for subsidizing the rates to the extent named. The only criticism to which Mr. Wilson laid himself open is that the conclusion he arrived at is not the logical outcome of his statement. There is nothing in his speech to lead up to the proposal to pay over £2000, or any other sum, in relief of the rates; so that this proposal stands revealed as a foregone commitment tacked on to an address which might have been used to support something altogether different. Mr. Bushell, who had an amendment to move, had no difficulty in giving a different turn to the finances of the undertaking. He had a pretty equally divided Council to deal with; but, by the tactful concession of allowing the operation of his adverse resolution to be deferred for a year, he won over waverers, and succeeded in carrying his point. We heartily congratulate Mr. Bushell on his triumph, which is one of reason and financial rectitude against all the forces of use and wont, expediency, and narrow Municipalism. The case of West Bromwich is really very simple. The Corporation bought themselves out of bondage to Birmingham for a great sum. Mr. Brockhouse, who supported Councillor Bushell's amendment, says the price of the goodwill was £40,000; and during the twenty years that have elapsed since the purchase only £4000 has been set aside for depreciation—meaning, it is to be supposed, the wiping out of this amount of dead capital. Birmingham was at the time making a profit out of the gas supply of West Bromwich; and it was therefore only natural that when the latter town succeeded to the business, it should have been the popular thing to carry it on upon the same principle.

Unfortunately, there is no exact definition of the trading profit of a local authority. West Bromwich voted itself a profit, and has realized and spent it to the tune of £25,000 since the gas-works were built. This money has been taken out of the undertaking, and is gone irrecoverably. Who is the better for it? Mr. Bushell can tell who are very much the worse—that is, the gas consumers and ratepayers of the borough. The capital burden upon the undertaking is too high. It still stands at £7 per ton of coal carbonized, notwithstanding the operation of the sinking fund and the great expansion of the undertaking; the gas consumption of the district having doubled in the past twenty years. If the so-called "surplus profits" had been applied to the reduction of the capital, the Committee would have been saved £9600 in interest. As it is, Birmingham is better off than West Bromwich in this regard by 2½d. per 1000 cubic feet. Mr. Wilson said that the gas-works loans will be wiped out, at the present rate of redemption, in twenty-nine years. This means fifty years from the start, and can only apply to the old capital. There will be fresh loans with which to carry on the gas undertaking. Mr. Bushell roundly declared that hitherto the Corporation have resorted to borrowing without making proper provision out of revenue. It is the old familiar story of short-sighted municipal gas finance. The penalty is a high capital account, which is a standing menace to the ratepayers, and a costly burden on the gas consumers. Mr. Brockhouse strengthened the argument by hinting darkly that the condition of the plant is not what it ought to be, especially having regard to the figure at which it stands in the books.

The opposition to Mr. Bushell was chiefly of the stereotyped kind. The capital did not compare unfavourably with the average of many places; and the price of gas was not higher than in neighbouring districts. Besides, if all the gas profits were applied as suggested, to put the finances of the concern upon a safe footing, the rates would have to go up; and the ratepayers ought to have some recompense for their risk. How remarkable it is that most municipal traders of this stamp are more anxious to get behind one another than to show a lead. It is so easy to excuse mediocrity, or even degeneracy, by pointing to others who are much worse; and averages can always be corrected by omitting inconvenient items. In this case, the example of Glasgow did not suit

the defenders of the old policy, so they merely dropped it out of their reckoning. As regards the asserted risk of the ratepayers, which is never heard of except when a subsidy is to be defended, should it not be clear that the best defence is a light burden? Hitherto, the automatic growth of gas consumption has shielded improvident finance, by reducing the capital burden as by natural process. Where is the guarantee that this process will continue to operate everywhere for another fifty years? That is the question for West Bromwich, and for many other gas-supplying municipalities, more especially those which serve populations dependent on particular industries.

Is Gas Coke Arsenical?

A VERY particular application to gas undertakings in the North of England is being developed out of the "arsenical "beer" scare. The subject was mentioned by Mr. Charles Wood, of Bradford, in his Presidential Address before the Manchester District Institution of Gas Engineers, and was further discussed by Mr. H. Townsend, as well as by Mr. Wood in replying to the vote of thanks. It is of such great and immediate commercial importance, that we have instituted further inquiries respecting the occurrence of arsenic in gas coke, and shall be glad to receive any helpful contributions on the subject. It is a matter that ought to be brought specially under the notice of the Royal Commission, which has already received evidence of the existence in malt of arsenic derived from the coke and anthracite coal burnt in the roasting. It is true that the quantities stated to have been found in coke were infinitesimal; but the mischief seems to have been done all the same, certain maltsters now ceasing their purchases of gas-works coke. It appears eminently desirable that all doubts about the matter should be authoritatively cleared up. Mr. Wood has placed it on record that Bradford coke made in one day was found to contain something considerably under one-tenth of a grain of arsenic per pound. This seems to be saying either too much or too little. The question is as to the possible recovery of even this proportion of arsenic in the malt roasted by means of the coke. One-tenth of a grain of arsenic per pound of coke is 224 grains per ton. It is unnecessary to consider the case of the sample of coke reported to Mr. Wood as containing 7 grains of arsenic per pound. The coal from which this coke was made must have been pretty nearly all "brass."

Now that the question has been raised, it will have to be completely answered, and those gas manufacturers who suffer most from the prejudice against coke which has been created by recent proceedings, will be well advised to place the whole matter in competent and impartial hands for inquiry and representation in the right quarter. Nobody would have thought, a year ago, of looking for arsenic in gas coke. But then, neither did they of hunting it up in the poor man's beer. We indulged the other day in a little ebullition of amusement at the spectacle of the analytical chemists, some of whom make so much of a little extra sulphur in coal gas, allowing a whole population to be poisoned by arsenic under their noses, without suspecting what was going on. Now it appears that the chemists are getting their own back, by implicating another gas-works product as a poisonous compound. It is hard to believe; but that there is a certain amount of justification for the impeachment stands confessed.

The London County Council Election.

THE election for the London County Council last Saturday week resulted in the return of more Progressives than ever, notwithstanding the effort made to identify the opposite party on this body with the dominant Conservative politics of the Metropolis. It is as well to take account of this remarkable fact, because Progressivism, as our readers are aware, stands for much that Gas Companies and their congeners must oppose and resist in their own and the public interest. It may well be asked how it was that London, which is not only overwhelmingly Conservative in Parliament, but is even more so in its new Municipal Boroughs, should have given quite another colour to its most powerful local governing authority. Irrespective of the academical question of the expediency of running the elections of local authorities on party political lines, why should the London County Council elections, worked in this way, turn out so differently from the others? Is London so enamoured of County Council Progressivism that it wants this party in local government to have a free hand? It is unnecessary to recite here the points of this set of opinion in matters of administration. Everybody knows them. For the present purpose, they may be indicated sufficiently by the names of Mr. John Burns, M.P., Alderman Ben Tillett, Alderman Taylor, and Mr. Steadman. These energetic gentlemen have every reason to be proud of the endorsement which they have just received from the ratepayers of the greatest city of the world.

Yet, in truth, the Progressives are where they are, not altogether by reason of the number of votes they themselves received, but largely through the abstention of voters previously found on the other side. Never was the force opposing Progressivism so weak. It is to be feared that this weakness can be only too easily accounted for. The opposition had no decided policy of their own, but adopted the fatal course of claiming a small share in all the realized and promised triumphs of their opponents—that is to say, they were only Moderates after all. Moderation in all things is the best rule of life; but it is not a weapon to fight the bear withal. Again, the most prominent workers are on the Progressive side. There were no picturesque personalities on the Moderate benches. The London voter did not care to turn out in such a colourless cause. The untimely issue, and the withdrawal, on the eve of the election, of the proposed new regulations of the London Water Companies, delivered all the consumers into the Progressives' hand. The public did not take the trouble to look into the merits of the regulations. All the Metropolitan Local Authorities tumbled over one another in their haste to condemn them. Moderates shrieked as loudly as Progressives against the Companies; but it was the latter, known of old as the bitter enemies of the Companies, who reaped the benefit of the agitation.

It is rather pitiful, because the probability is that if the water supply had been in the hands of the London County Council, as the Progressives wish, the same regulations, or even stronger ones, would (as was pointed out in our "Water Affairs" last week) have been insisted upon, and no nonsense about it. In questions of politics, however, it was ever found that one side might steal a horse while the other might not look over the hedge. When a water company or a gas company gets a bad name, nothing it can do will please the powers. This is really one of the strongest arguments for municipalization. It is high time for the property to change hands, it may be said, and let the other side see what they can do with it. As a rule, they do precisely the same as was done before; but with the change of circumstances, the old irritation dies away. The new London Council will return to work like a giant refreshed; and everything that happens to stand in the way of Progressivism will have to look out for itself.

WATER AFFAIRS.

Progressives and the London Water Question.

THE Progressives in the new County Council are naturally very jubilant over the victory they achieved at the recent election. Their jubilation is all the more justified because their remarkable success on that occasion was in a large measure attributable to the tactics and the attitude of their opponents. In the first place, the Moderates decided to abandon their old title, and go into the contest under the banner of Conservatism. They fought the election upon political party lines, and by so doing estranged numbers of their old supporters. The reason is not far to seek. Many men are Conservative on Imperial questions, but Progressive in respect of all matters relating to municipal life. On the subject of water supply, the ordinary voter has very strong views. Rightly or wrongly—in our opinion the latter—he looks upon the Water Companies as his natural enemies. Unfortunately, this attitude towards them is the result of inadequate knowledge. He knows little of the work of the Official Water Examiner or of Dr. Thorpe and the Government Laboratory, much less of that of Sir William Crookes and Professor Dewar. As for the recommendations of the Royal Commission, he either ignores or scoffs at them. He opens his halfpenny newspaper, the source of his information on this and most other current topics, and reads therein that he has served out to him by grasping monopolists—"Water Lords"—a few driblets of cholera-charged liquid for which he is called upon to pay in advance an exorbitant price, even if he does not afterwards receive a supply of the

pestiferous fluid; and when he hears similar statements repeated upon the platform, and is assured by a prominent member of the House of Peers that the only remedy for this state of things is the transference of the water supply to the London County Council, who "for eleven long years have "knocked at the door of Parliament and of the Government, "and have urged them to take some action in regard to the "question," it is hardly surprising to find him either supporting a Progressive or not voting at all. There is very good reason for believing that the latter attitude was a potent factor in determining the result of the election; for those who were not with the Moderates were against them.

But though the Progressives are back in Spring Gardens with a majority of sixty, they must not suppose, as some of their supporters in the Press evidently do, that they will be able to push their Water Bills through Parliament without opposition. It is true that London has spoken decisively on the Water Question, and the Council's Purchase Bill has been so modified as to be now, on the whole, a fairly acceptable measure. But in this matter other parties have a voice besides London. The new Council may have "received its order to "proceed with its Water Bills," but they may experience more difficulty in carrying it out than they for the moment imagine. In the first place, there is the obstacle of the Government's attitude towards the Bill. The President of the Local Government Board told the Council plainly last December that he should advise the House of Commons to reject the Bill, as it was his intention to introduce next session a measure dealing with the subject; and last Tuesday he informed Mr. M'Laren, the member for Bosworth, who had questioned him on the point, that he had not seen any necessity for altering his views. It appears, however, to be the intention of the Council to ask him to reconsider his decision, and allow the Bill to pass the second reading and be referred to a Committee. Then there are the Borough Councils. The petitions already presented against the Bill show that it will encounter opposition from those quarters. The Councils are far more likely to receive proper consideration from the Government than they are from the authority at Spring Gardens; and they will prefer to wait for the appearance of Mr. Long's promised Bill, than to take what "London's Parliament" thinks fit to offer. But whenever the transfer of the water undertakings is determined upon, whoever may be the controlling body, it must be effected on a fair and equitable basis. As already remarked, the Council themselves recognize this, as shown by the altered terms of their Bill, although some of their supporters do not. Whether the purchase will result in benefit to the ratepayers and consumers or not, remains to be seen. Lord Llandaff's Commission came to the conclusion that, unless the charge for water were increased, there would be a deficit in the income which could only be met by coming upon the rates. This has been pointed out over and over again since the publication of their report; and the fact has been quite recently emphasized by Lord Avebury, in his address to the Royal Statistical Society. But if London is determined to municipalize the existing water-works, and undertake a gigantic scheme of auxiliary supply from Wales, the ratepayers must not be surprised if they find themselves called upon to sustain heavier financial burdens, or complain if, while bearing them, they are no better served than now.

More About the Water Famine in New York.

THE news which reaches us from time to time as to the scarcity of water from which the inhabitants of New York are suffering (as mentioned last week), affords striking proof that, even under the beneficent care of a Municipality, consumers do not enjoy immunity from certain inconveniences which are commonly, but erroneously, supposed to be associated solely with company management of water-works. According to the latest advices, the supply in the borough of the Bronx is so short, that a dollar a pailful is readily paid by householders to anybody who is able and willing to take the water to their doors; while in Brooklyn the situation is stated to be alarming—the pressure being very low. It is reported that the officials of the Water Department attribute the shortage to drought, and say that only an immediate heavy rain will prevent a calamity. Outsiders, however, are unkind enough to assert that it is due solely to the refusal of the Municipality to grant any money for setting up relief pumps, and to their neglect to stop the great leakage which, as is well known, exists in the city. When, owing to an exceptionally long period of dry weather, the East London Water Company were compelled in the summer of 1898 to curtail the supply in their district, they did all they possibly could, by obtaining assistance from neighbouring Companies, to minimize the inconvenience to which the consumers were temporarily subjected. Earthen vessels were provided for storage, and carts were sent round to deliver water. And yet the Company met with nothing but abuse. The present trouble in New York, however, as we hinted last week, is attributed to a very different cause from that stated by the officials. The whole thing is part of a plot. It is asserted that the water is being deliberately shut off by a private Company with the view of forcing on the conclusion of an agreement with them for an auxiliary supply, and that members of the State Assembly have been induced—we need not say by what means—to give their votes in favour of the legislative measures necessary to this end. And yet more water than is used in New York goes to waste over the Croton dam!

ESSAYS AND REVIEWS.

TRADE DISCOUNTS.

A VERY practical question for engineering and building constructors, which is for some reason kept very much in the background of public discussion, is the discount system of pricing engineers' and builders' supplies. This is a subject which gives a vast amount of vexation, especially to large buyers and such as are agents for those who find the money. It would be well worth the while of any engineer and gas manager who has the necessary time to devote to the task—they all have the requisite experience—to go into the matter thoroughly, and give his results in the form of a paper for discussion at a technical society meeting. Traders in gas-works supplies have recently been considerably shaken up in regard to their list prices and discounts; and perhaps they have not yet heard the last of the matter. In order, however, to make the present article as impersonal as possible, we will avoid all direct reference to particular traders and their ways of doing business, and discuss the subject of trade discounts in a general sense. In doing this, we do not wish to conceal the special bearing of the system upon the expenditure of gas companies. It is notorious that gas and water companies are commonly regarded as fair game for all dealers to fly at. They expect to get the very highest prices from this order of buyers; and often succeed in their design through the carelessness or ignorance of the purchasing agents of the Companies of the prices at which other buyers can get the same goods.

This common commercial practice is illustrated by a certain Gas Company's recent experience, related to us. The Engineer of the Company happened to notice in a machine shop which he was visiting a particular tool that struck his fancy. He asked the cost of it; and a sum was named. He, in his turn, sent the makers an order for one, which was duly delivered—with an invoiced price nearly 20 per cent. higher than the cost stated to him. Upon inquiry, he was informed that he had been charged the "regular price to gas companies." Mechanical engineers and other "trade" purchasers were charged the lower price. This, naturally, was an unpleasant surprise to the officer, who made a special report on the circumstances to his superiors. It is easy to perceive how serious trouble might arise in this way. Supposing one of the directors of the company to be in "the trade," of any kind, and to see an invoice priced out on the higher scale, he might be excused for suspecting that matters were not quite as they should be in the establishment.

Such a practice as the above operates in restriction of trade. It is also plainly unfair to firms who deal justly. Purchasing officers of companies are thereby encouraged in demanding stiff and unreasonable concessions from casual business connections. The "JOURNAL" receives many complaints from merchants who receive occasional orders from companies and local authorities, of the stupid, cast-iron, and frequently unjust conditions attached to payment. In cases of large contracts, both parties know what they are about, and go into the affair with their eyes open; but it is otherwise with transactions passing "over the counter." The fact of the matter is that the officials of the purchasing bodies are fully aware of the existence in trade of discount systems, often extensive and peculiar in character; and they consequently take a high-handed course for averaging all deals according to what they consider a fair rule.

Gas companies' and corporation officials likewise often arrogate to themselves the right to pay for everything they order, in however small a way, on the wholesale scale. If there is an even lower "export" scale of charge, they expect to get the benefit of that. This is not fair. Neither gas companies nor municipal corporations have a right to expect "trade terms" in everything. There used to be a very homely criterion in this matter, which consisted in the point of whether the purchase was for consumption, or "to sell again." If the latter, whatever the amount of the transaction, it was priced at the trade rate. Large private buyers paid the full price, in the absence of a prior arrangement. Now, there are many supplies which gas companies and corporation gas departments cannot be said to "sell again." In the

absence of a special contract, therefore, they ought not to expect to be put upon trade terms. Some of them do expect it, in regard to everything, simply because they are "big" concerns. That consideration does not affect the merchant who is required to open an account, and perhaps submit to all manner of office regulations before he obtains payment for some sixpenny matter.

The above relates to common trading. In connection with works of construction, whether wholly or in part subject to contract, the question of trade discounts is very perplexing to the engineer. We may quote on this head no less an authority than Mr. Thomas Blashill, late Architect to the London County Council, who recently read a paper, at the Surveyors' Institution, on the "Present Condition of the Building Industry." Among other things touched upon by Mr. Blashill, was the desirability of the architect—in our case the engineer—taking pains to look up such sources of information concerning structural details as manufacturers' price lists and show-rooms, trade advertisements, and sectional exhibitions. Here arises the difficulty of the trade discount. Mr. Blashill states that he had a lesson on the subject of discount-grabbing by contractors through specifying a first-class article at a price which he believed would be payable to the maker. The contractor wanted to substitute something different, manifestly inferior, alleging unreasonableness in the matter of discount of the manufacturer nominated. Evidence was produced that the manufacturer had offered a discount of 52 per cent., besides the usual discount for cash. Consequently, the terms of the specification had really allowed the contractor the full price he would have had to pay, with at least 10 per cent. profit. Some people are never satisfied.

On the general subject Mr. Blashill remarks: "I am told that the secret of trade lists with their discounts cannot be penetrated by architects, and the system cannot be altered. If that be so, we should cut the knot by demanding to know from those who send price lists and offer their goods for our choice, their lowest price to a safe cash customer. If this is inconvenient to anybody, the architect should take the ground that things must be made convenient to him. The worst feature in the system of large and varying trade discounts is that they furnish a fund out of which 'secret commissions' can be paid to persons ordering for the client particular goods." In some cases, as is notorious, these so-called trade discounts were designed with this express object. The agent for the purchaser was informed that the invoiced price covered a fixed commission for himself. "There it is," said the tempter, "it doesn't belong to me. If you don't take it, your people won't get the goods any cheaper. That is for you, and not for them or anybody else." The less heard of this kind of trade discount the better; but it would be foolish to pretend that the evil custom is obsolete.

Everybody knows that the customary book-trade discount has been abolished by the action of some publishers, who now sell their publications at a net price. There may be a few other articles of commerce which do not carry trade discounts; but there cannot be very many. On the other hand, the question of intrinsic cheapness is not affected one way or the other by the circumstance of a trade discount being borne or not by the selling price. The fashion of cash dealing, inaugurated by the co-operative stores, has been adopted by speculative traders; and so many manufacturers of articles in general demand offer to trade directly with all comers, that the old distinction between wholesale and retail prices appears to be in the way of being obliterated. This is not really the case. The difference will always exist, in a degree; but not to the same extent as formerly. The one retail trade which at present seems to keep up the effort to resist the process of levelling-down prices is the ironmongers. These tradesmen still stick out for their big discounts on such articles as ornamental gas-fittings, gas-stoves, and the like. The question of the fairness of shopkeepers' discounts is largely bound up with that of other conditions of the trade—such as the necessity for keeping costly stocks, the rate of turnover of the trading capital, and so forth. These matters affecting retail trade are not the subject of this article. We must make this clear, or we shall have trade journals accusing us of questioning the right of the retail shopkeeper to his means of winning his daily bread—a hard task enough, these times.

The object of this article is to raise the question of the fairness and the propriety of manufacturers having different rates of discount off their published price lists, which they, or their agents, apply or suspend at will, unequally, and with discrimination as between various customers. Unless this question can be answered in the affirmative on reasonable grounds, we shall hold the opinion which appears to be the natural conclusion in the circumstances—that such unequal dealing is unfair. Absolutely equal treatment of all customers by a merchant is not required by English law. Ordinary traders—not statutory supply undertakings—are free to favour any customer they prefer, in the matter of prices and conditions. This freedom is balanced by the opposite and equal right of the buyer to have nothing to do with a merchant who places him at a disadvantage. Therefore, those traders who have too many different prices for their goods cannot complain if purchasers prefer to deal elsewhere. The matter is one which calls for the earnest attention of merchants, manufacturers, and wholesale dealers. The suspicion is abroad that there are secrets in many price lists; and this uncomfortable feeling is enough to hamper trade. It is not for us to suggest the steps to be taken by firms suspected in this way, with the object of setting themselves right with their public.

ELECTRIC LIGHTING MEMORANDA.

The Board of Trade Inquiry into the Voltage Question—Dr. Kennedy's Evidence—Local Authorities' Defiance of the Law—The Crown Protects the Statutory Rights of the Public.

THE Board of Trade inquiry into the voltage question in connection with Metropolitan electricity supply is progressing. In effect it is an application on the part on certain companies and local authorities supplying electricity to be relieved from the statutory obligation to obtain the consumers' consent before changing the voltage of domestic supplies. The Westminster Company are the appellants on behalf of themselves and the other undertakings interested; and the selection is a very good one for the purpose, inasmuch as this Company have changed over from 100 to 200 volts to the satisfaction of 5500 of their consumers, and have only eight consumers who insist upon retaining their 100-volt supply as a matter of right. A strong array of expert evidence was adduced to show that consumers are not injuriously affected by an increase of voltage at their terminals, even up to 250 volts—the maximum which is adopted by the Corporation of Glasgow. Dr. Kennedy, for the Westminster Company, was, as usual, conspicuously fair on this point. It was not until 1895, he said, that he became convinced that reliable 200-volt lamps could be obtained; and he then advised the Company to make the change. He denied that the change increases the risk of fire; because more care is taken over the installation. On this head, Dr. Kennedy's testimony must have made some of the applicants feel rather uncomfortable; as he admitted that the Westminster Company had deemed it advisable to make a thorough house-to-house inspection of fittings, and had exchanged new lamps for the old ones. This had cost the Company £45,000. On the figure already given—5500 consumers—this is an expenditure of upwards of £8 per head. It may be doubted whether all the undertakings desirous of making the change are prepared to pay for it at this rate, in addition to reducing the price of the unit.

The benefit to the Westminster Company of changing to a higher voltage was clearly stated by Dr. Kennedy. First of all, they save £7500 per annum, which it would be necessary to spend on mains in order to keep the distribution losses down to 12½ per cent. This figure, then, is the proportion of unaccounted-for electricity which the highest electrical opinion is prepared to accept as permissible. By increasing the voltage to 200, the Company's mains will last another 21 years before the loss will attain this ratio; and the actual loss will be immediately reduced to less than 5 per cent. Consumers must derive some benefit from this economy, if they are fairly treated. Dr. Kennedy was pressed by the opposing Counsel, until he admitted that, leaving out the question of lamps and price of current, consumers are no better nor worse off at 200 volts than at 100 volts. The light is about the same, and so are the duty and price of the lamps. Mr. W. A. Chamen, Electrical Engineer to the Glasgow Corporation, generally corroborated the evidence of Dr. Kennedy. In the course of his evidence, he innocently proved our point of last week—that where the service is in the hands of the local authority, the old protection of independent supervision vanishes. It suited the Corporation of Glasgow to raise the voltage of their domestic electricity supply from 100 to 250 volts; and they did it. True, they took the precaution of preparing the consumers' fittings for the alteration, at an average cost of £14 or £15 per head; and they obtained the consumers' consent to the change. But it never occurred to the authorities that any proceeding but to take the law into their own hands was necessary until after they had done it. That is municipalism all over. Mr. Chamen agreed that the average efficiency of the high-voltage incandescent lamp is 4 watts per candle. This is also Dr. Kennedy's figure.

In the district of the Chelsea Company, not only have two-thirds of the consumers voluntarily accepted the 200-volt supply; but they have also paid for all incidental expenses of the change. This speaks well for the diplomacy of the Company's officials. The occasion of changing over was also made the opportunity for altering the system of charging from the uniform price of 6d. per unit, at 100 volts, to 6d. for the first 1½ hours, and 3d. for every unit consumed afterwards. Chelsea being largely a good-class residential district, where "early hours," to put it mildly, are not universal, many consumers found benefit from the change. The Engineer of the Company estimates the saving by the public at £3000 for the year 1900. On the other hand, the saving to the Company from doubling the voltage in the mains will be from £2000 to £4000 a year. Following the Chelsea Company, at the resumed inquiry on Thursday, came Mr. S. Baines, formerly of Bradford, now Electrical Engineer to the St. Pancras Borough Council. Mr. Baines recounted the experience of Bradford, how at the original supply (at 115 volts) the mains soon became full, and the voltage was doubled in order to save the expense and inconvenience of duplicating the mains through the town. The expedient proved so successful that other electricity supply undertakings followed suit. In the case of St. Pancras, the witness admitted that the Borough Council threatened to cut off the supply to several consumers unless they consented to the change, knowing at the time that this proceeding would be illegal. More municipalism! If our trading local authorities go on at this rate, disregarding the provisions of general and particular Acts of Parliament whenever it suits them to do so, and riding roughshod over helpless individuals, Parliament will have to see that some other competent and trustworthy agency is vested with their abnegated powers for the protection of the public.

All these edifying confessions on the part of the high-voltage interests made a splendid opening for the weighty protest of the representative of the Crown in respect to the conditions of supply of the State Apartments of Buckingham Palace. It has been ascertained that the cost of overhauling the wiring and making the proposed change of voltage and lamps in this instance will amount to about £1500. The supplying Company, rather than incur this expense, prefer to go on supplying at 100 volts as usual; but they charge a higher price for it. Besides, said this formidable opponent, any alteration such as is proposed can only be a temporary measure of relief; because sooner or later the mains are sure to become overloaded again. What will the undertakers do then? The Crown suggested that if the change is to be made, the words "provided always that none of the cost of conversion shall be borne by the consumer" should be added to the regulation. In order to make this protection real, it will be necessary that the terms of the regulation should be printed on the face of every demand note, as well as advertised in local newspapers. On the point of the discrepancy between Dr. Kennedy's and Mr. Chamen's statements of the cost of changing the voltage, it is obvious that if the expense of altering the fittings of the Royal Palaces and the big hotels were included in the former, it would materially decrease the difference.

DEPRECIATION OF MUNICIPAL ELECTRICITY SUPPLY UNDERTAKINGS.

One of the catch-words of the day, in the vocabulary of national politics, is "decentralization." It is a characteristic of the British public, as represented by newspapers and platform speakers, to take up from time to time with phrases and words with a view to the saving of thought. This is an unavoidable consequence of the multiplicity of the matters of interest and importance upon which the ordinary citizen is expected to have an opinion. It has been said that, in public affairs of first importance, the British public can only attend to one thing at a time. This remark is perfectly true; but things have a way of following one another so quickly, that to all intents and purposes the English citizen finds himself constrained to think about them, or to make believe that he thinks about them, all together. In this process, the catch-word system comes in very useful. When once the average Briton has appropriated to himself one of these substitutes for thought, he is quite satisfied to work it for all it is worth. He thus saves himself a world of trouble, while yet passing for a person of enlightened judgment in affairs. Take now, for example, the word "decentralization," as applied to matters of government and administration. It indicates the backward swing of the pendulum of statesmanship from the position to which it was farthest carried in the Napoleonic idea of government. There is much to be said for the Napoleonic system of centralization for the administration of public business. It ensures uniformity of practice, among other results; and the forces of improvement and enlightenment have only to conquer at head-quarters to triumph everywhere with the smallest loss of time.

Unfortunately, centralization has been found in practice to abound in drawbacks and weaknesses which for many purposes outweigh its advantages. In England, the rule of the opposite principle in matters of local self-government has been definitely accepted as preferable. Thus, although it is quite possible that a high official of the National Government, stationed in Whitehall, knows better what is good for a particular locality than the local District Council, on the whole it is desirable that the local community should be left to look after themselves within very wide limits. If the people in question choose to make a rod for their own backs, that is their affair.

The assumption underlying this principle of decentralization in local government is that the people upon whom the responsibility for governing themselves reposes are fairly competent to discharge it, in harmony with the standard of efficiency of the period. This assumption involves the antecedent supposition that they are people who know pretty well what is going on around them, and generally "how the world wags." Usually, this is so. There is no portion of the United Kingdom so utterly out of the world that a fair proportion of the inhabitants cannot be trusted to rise to the occasion offered to them by the national system of devolved administrative duty. Curiously enough, the places that seem to be most difficult to regulate on this assumption are parts of the Metropolis itself. Some London parishes are reputed as having sunk below the level of residential respectability necessary for the production of a reliable local authority; while in others, owing to the fact of the best class of inhabitants being "birds of passage," the local administrative perforce falls into the hands of those who have insufficient financial responsibility for the execution of their own resolutions.

In at least one important matter, however, the amount of knowledge of passing events at the command of the elective local authorities of the United Kingdom has proved lamentably inadequate to keep them from blundering, and the ratepayers, whom it is their duty to protect, from uncalled-for loss. This is the statutory supply of electric lighting from central stations. Throughout the country local authorities have fallen easy victims to touting "consulting electricians," who, for the sake of the fees they could make out of the job, have induced locality after locality to embark upon an electricity supply undertaking which can never pay its way. The names of these astute gentlemen crop up from every part of the country, with painful iteration. Somehow or other, these practitioners on the vanity, the ignorance, and the cupidity of small local magnates, who should know better, succeed over and over again in bagging orders for electrical installations on sheer false pretences. Of course, after the plausible electrical gentleman has taken his last cheque and departed, the small District Council have to make the best of their bargain. Their victimizer knows that, so far from having any reason to fear exposure at their hands, he can refer to them with confidence for a testimonial; they will never confess to having been "taken in."

The great inducement held out by the travelling electrical tout for a local authority to venture upon electric lighting is the prospect of a profit to be available for reducing the rates. In the scores of "reports" on proposed village electric lighting schemes which have come under our notice, this attraction has always been paraded as the certain result of entrusting the author of the report with the commission for the job. In almost every case this specious offer has been warmly supported by the local newspapers, the conductors of which never seemed to learn that electric lighting is not a gold mine everywhere. In all these cases the same routine is gone through. Some leading man is won over; the rest follow his lead; an "inquiry" is held; and in the end the community is kindly allowed to hang round its neck an "enterprise" which the ratepayers will have every reason to be sorry for in the long run. London, locally, is as bad as any place for this. Parish after parish gets drawn into the consulting electricians' net; and for one community, like Tottenham and Edmonton, which sends the touts packing, more pay them, and afterwards practise every means of concealment to hide the extent of the drain upon the public funds.

In the issue of the "Electrical Review" for the 1st inst., there appears a weighty article entitled "The Question of Depreciation," which deserves all the publicity that can be given to it, in places threatened by electrical touts. It begins with the observation that, in dealing with the accounts of electric supply undertakings, the question of a fund to meet the cost of renewals and depreciation of plant is of considerable importance. In the case of municipal undertakings, this point is, in the majority of instances, altogether ignored. The good example of Glasgow is cited; and the following scale of depreciation is given as that adopted by the Corporation: Land and buildings, 1 per cent.; machinery, 7½ per cent.; accumulators, 10 per cent.; mains, 2½ per cent.; meters, 6 per cent.; and instruments and counting-house furniture, 5 per cent. The average amounts to a charge of about 4 per cent. on the total capital outlay. In addition to this provision, there is the sinking fund for repayment of borrowed capital, and the interest on the loans. The result is that Glasgow charges about 9 per cent. on the electric lighting capital; and this made the eighth year's surplus profit on the whole undertaking £40. The average charge per unit was 3·51d. to private consumers, and 1·64d. for the public lamps. Consequently, even in the case of such a city as Glasgow, there is absolutely nothing left for reduction of the rates out of the electric lighting undertaking. Edinburgh is working on the same lines.

Yet, notwithstanding the absolute validity of the principles of accountancy followed in these leading cases, very few municipal electricity supply undertakings in the United Kingdom have a depreciation fund; and those uninstructed town councillors who consent to this improvidence probably do so by the advice of those who maintain the false doctrine that the sinking fund for the repayment of the borrowed capital renders such a fund quite unnecessary. The effect of this false book-keeping is to give a fictitious character to the results of the trading. The instance of Dewsbury is quoted in proof of this contention. Here, after five years, the Corporation electric lighting undertaking represents a capital outlay of £33,155. The gross revenue for the last municipal year was £4031, against which an expenditure of £3085 on revenue account—including £795 for interest—was charged. The result is to show an "alleged surplus" of £945; whereas if the property were depreciated on the Glasgow scale, there would be an amount of £1326 to charge. Adding the sinking fund charge of £748, there would thus be a deficiency on the year's trading of £1129 to be borne by the rates. Another case is mentioned—that of Canterbury, for which a surplus of £406 is claimed on the first year's trading. This, as is well remarked, is just the sort of statement calculated to mislead the authorities of other localities contemplating a similar venture. It is a very bad case of corporation account-cooking. The first published accounts, showing the surplus referred to, make no mention of a previous year's loss of £450, paid out of the rates and so wiped off. There is no provision whatever for depreciation; and the entire charge against revenue for repairs and maintenance is £37 on a property costing £32,453—say, 2s. 3d. per cent.! On the Glasgow model, another £1300 would have to be found before anything could be claimed as surplus profit.

Those who put themselves forward to advise local authorities in these matters are fast enough to argue that, because Edinburgh, Glasgow, or Liverpool show a profit, therefore Hendon or Barking can depend upon securing a surplus. This is sufficiently absurd; but if Glasgow is to be cited at all, let it be done in all respects. The "Electrical Review" proceeds to expose the financial unsoundness of the five leading London municipal electricity supply undertakings—Hammersmith, Hampstead, Islington, Shoreditch, and St. Pancras—which altogether stand for a

capital investment of close upon a million sterling. The total amount allowed for the depreciation of this property was £123 last year. They thus show a profit surplus of £18,758; whereas if the example of Glasgow had been followed, there would have been a loss of £20,500. If there is any truth in accountancy, or any common sense in Glasgow, this loss will have to be paid somehow. It has been generally overlooked that the London County Council has already warned these eaters of the cake they still wish to keep, that not a penny of additional capital shall be allowed to them in respect of anything already represented by borrowed money.

Our contemporary righteously pillories the stale old fallacies of municipalism—of there being no directors' fees to pay, of municipalities being in a position to command the best engineering advice, and being able to raise capital cheaply. The fact is, as is claimed, companies are far better off than local authorities with respect to capital. They have no interest to pay unless they make profits; whereas the municipalities, trading without capital, have to pay the interest, and redeem their loans, whether they make profits or not. Then, the companies do not pay extravagant fees in order to obtain the best engineering advice; whereas in one Metropolitan borough the fees of the Consulting Electrician amount to £12,000 on the first installation. The fees on the abortive Tottenham and Edmonton joint scheme, already mentioned, were reckoned at £23,000 on a total outlay of £345,000.

The obvious moral is that local authorities have no business to go a-pioneering in electricity supply, at the cost of the ratepayers. They should let private enterprise try all doubtful adventures; especially as the law enables these ventures, if successful, to be bought in the public interest at a fair valuation. The soundness of this counsel is not impaired by the consideration that some local authorities who have purchased established electricity supply businesses have been "had" over the deal. There are usually "wheels within wheels" in such cases; and in the circumstances the unfortunate public would be "done" anyhow. To return, however, to the question of the depreciation charge on municipal electricity supply undertakings, the conclusion from all the evidence is that undertakings which do not show a clear profit balance on revenue account of at least 9 per cent. on the capital outlay, to be properly appropriated for interest, redemption, and depreciation, are not paying their way.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 704.)

THE week just closed was not a particularly bright one on the Stock Exchange. The opening was fair enough, and afforded good promise; but for various reasons an altered tone soon prevailed in most departments, though at the close it was again inclined to mend. Prices all through the list, except American, are lower; the Funds and Home Railways being especially flat. The Money Market moved in a fitful way, and the tendency was very irregular; but it finished off with an inclination to pronounced ease. In the Gas Market business was on the whole no more than moderate, although now and then it flickered up as if it was going to be really bright. The tendency was favourable; and though there were not so many improvements in price as there had been in the preceding week, the general upward movement in Gas stocks was fairly advanced. The only moves downward were in a Foreign undertaking and in Gaslight preference; and the latter was probably more influenced by money movements than by Gas affairs. The ordinary stock of the same Company was moderately dealt in, and at very even figures; but at the close it did not show out at its strongest. The secured issues were little touched; and the only change was that noted above. Dealings in South Metropolitan were only moderate and at level figures, indicating steadiness, but naturally without any disposition to advance. Commercials were quite ignored, and made no sign whatever. In the Suburban and Provincial group, there was more activity than has lately been the rule, coupled with further advances in quotations; Brighton, British, Tottenham, and Newcastle being the gainers. The latter Company now has the distinction of being the highest priced in the list; and it is noticeable that in their local exchanges all the leading provincial undertakings command prices which are rather in advance of London and Suburban prices. Business on the whole was very quiet in the Continental Companies, though Union preference brisked up a bit; but the tendency was favourable, and Europeans advanced. Among the remoter undertakings, Hong Kong and River Plate were a little better, and Buenos Ayres a little worse. In the Water Companies, there was a considerable accession of activity. The Progressive majority in the London County Council seemed to have no terrors for investors; and prices were steady, with the exception of West Middlesex, which had a fall.

The daily operations were: Gas opened quietly but firmly. British and Tottenham debenture rose 1 each, and both Europeans ½; but Buenos Ayres fell ¼. West Middlesex Water receded 4½. Tuesday was more active, and generally firm. Hong Kong rose ½, but Gaslight preference fell 1. Wednesday was active, and Thursday was quieter. On neither day, did quotations vary. Friday was strong and quiet. Brighton original gained 2, and River Plate ¼. Saturday was quiet and firm. Lambeth Water fell 3.

AMERICAN GAS, WATER, AND ELECTRIC LIGHTING STATISTICS.

THE United States Commissioner of Labour took for the subject of his Fourteenth Annual Report (1899) that of the Water, Gas, and Electric Lighting Plants, under private and municipal ownership, in the States. This report was compiled from data specially collected by the Bureaus of Labour Statistics throughout the country, in accordance with a resolution adopted at the annual convention of the officials of the bureaus in 1896. The resolution recommended that an investigation should be made into the question of the municipal ownership of the before-mentioned plants—"this investigation not to be considered for or against municipal ownership, but for the purpose of ascertaining all facts bearing upon this question." There is a certain unintentional self-revelation contained in the wording of this resolution that is somewhat amusing. The idea of an investigation being started with the deliberate intention of finding "for or against" a certain policy would apparently not strike the Labour Bureau officials as a novel or absurd one.

Those officials appear to be somewhat of "innocents" in regard to the Municipal *versus* Private Ownership controversy, as the report states that "there will be disappointment, because the facts classified will not, and cannot, settle *conclusively* the merits of the two systems of management—private and municipal." Most certainly, no one having any acquaintance with the past history of the subject would have been so foolish as to imagine that any investigation would settle "conclusively" the merits of the two systems. The report shows that the Commissioner of Labour discovered before he had finished compiling this enormous mass of statistics, that it is as easy to constitute a useful comparison between Westminster Abbey and a sack of potatoes, as between two gas or two water undertakings working under totally differing conditions.

In order to obtain statistics from the various companies, it was found necessary to undertake that all returns should be treated as confidential, accounts not being necessarily made public as they are in this country. The returns have therefore been grouped according to the size of the undertakings, no names of towns or states being given. The report accordingly affords no basis for disputes between town and town as to the relative efficiency of municipal and private control.

The following statement shows the total number of gas, water, and electric light undertakings in the United States, grouped according to ownership:—

	Under Private Control.	Under Municipal Control.
Gas-works	951 ..	14
Water-works	1539 ..	1787
Electric light plants . . .	2572 ..	460

It will be seen that practically the whole of the gas undertakings are in private hands. No possible comparison could be drawn between the results achieved by the two systems on such a slender basis as could be constructed from these returns, even by the most ardent of the advocates of municipalization.

Returns relating to 355 out of the 965 gas-works are included in the report; but the 355 account for practically one-half of the total capital invested, and therefore include the more important of the undertakings. Of these works, 175 produce only coal gas, 102 only water gas, 60 both coal and water gas, 17 only oil gas, and 1 produces both oil and water gas.

Only 28 of the above works have an annual output exceeding 100 million cubic feet. Of these, 5 have an output of over 1000 millions—the largest make being 7635 millions—and are all run by private enterprise. We cannot attempt to even briefly summarize the mass of statistics included in the report, but will merely note a few points of special interest. One of the most striking features in the tables, is the generally high percentage of unaccounted-for gas. The large majority of the works show a considerable percentage, not a few of them losing more than one-third of the total output; while in one case, out of a make of 5,428,340 cubic feet, 2,402,040 feet, or 44·2 per cent., was lost by leakage. At the other extreme, is an undertaking losing only 0·08 per cent. of its output. These figures seem to suggest inaccuracy in the records kept by the concerns in question.

Prepayment meters are in use in the case of 47 out of the 355 undertakings reported upon. The unit of price is, in most cases, 25 cents—that is to say, the meters are similar to our shilling-in-the-slot machines. In 8 companies the unit of price is 5 cents, and in one case 10 cents. The price charged per 1000 cubic feet varies from 4s. up to 10s.; but in the larger companies, it is generally not much above the dollar. The report states that "a comparison with the ordinary meter service shows that the price through prepayment meters approximates very closely that through ordinary meters."

A considerable number of gas-engines are in use. The larger companies do not give the figures; but the total running in the districts of the undertakings reported upon may be put at about 3000. Reduced prices for gas consumed for purposes other than lighting, and for consumptions exceeding certain limits, are charged by many of the companies; while discounts are in a large number of cases allowed for prompt payment.

Finally, we should not recommend our readers to invest in this compilation. It is of little practical value, and we cannot but

think that the time and money spent in constructing this appalling mass of statistics was largely wasted. The fact that none of the returns can be identified with the undertaking furnishing it really destroys their interest; and we should be surprised to find that anyone had discovered in the book any information sufficient to compensate them for the task of digesting the 1000 pages of dense statistics.

SEEN AT SOUTHALL.

THE younger generation of engineers of all branches have much reason for thankfulness for their many opportunities. The day was when an ignorant exclusivism caused the operations of the large engineering establishments in this country to be conducted as it were in secret—when processes and methods of working were jealously guarded, and when the would-be learner and seeker after extended knowledge found the gates of the factory and the workshop barred tightly against him. Nowadays the inscription "No Admittance Except on Business" rarely frowns down on the student; and the warning "Trespassers will be Prosecuted" does not alarm him nor turn him from his quest for knowledge. It is not advisable, everyone will admit, to have strangers wandering at their own sweet will over a large establishment; nor is it convenient to have the members of the official staff interrupted at all seasons in their work. But happily things are not now as they were—the rigidity of the older days has been relaxed to the common advantage. Now a proper previous application and introduction will usually secure to individuals an entrance to works; and men and students who are associated together for their own intellectual advancement and for the elevation of the welfare of the industry with which they have cast in their lot, can always obtain the privilege of inspection of some of the best of modern works. Daily are the eyes of employers in the world of manufacture and commerce opening wider to the perception of the truth that to maintain their own status and expand their markets they must themselves foster, and give opportunities for, technical education among and to those they employ; and one form in which they can assist in the work is to throw open their factories and shops to students, and encourage their own employees when opportunities afford to inspect others. That there is a growing sympathy with the efforts made by societies of young men in the direction of self-improvement is evident. For instance, such bodies as the Institution of Junior Engineers and the Manchester and District Junior Gas Association, appear to receive a most cordial welcome wherever they seek to go. And as a means of cultivating extended knowledge and enlarging the ideas of a student in his profession, nothing can beat a good range of visits to works.

Last Friday week, a paper written in an admirably instructive style on "Carburetted Water Gas" was read before the Institution of Junior Engineers, by Mr. Samuel Cutler, jun. We gave a *résumé* of it in last week's issue. The paper was prepared with a view of imparting information particularly to the uninitiated; and it fulfilled its object. But it was a happy idea that the written communication should be followed by a visual examination of the system of manufacture in actual operation; for, simple as the working is to the initiated, a written description gives the uninstructed the idea that there is something very intricate about it. Therefore, their curiosity having been aroused by the paper, about fifty members of the Institution availed themselves of the privilege extended to them by the Directors of the Brentford Gas Company and their Engineer (Mr. James Husband) to visit the Southall Gas-Works last Saturday for the primary purpose of inspecting the installation of Cutler's carburetted water-gas plant, and afterwards other sections of the plant. In the absence of Mr. Husband, the Manager of the works, Mr. William Bugby received the visitors, who found in him a courteous, willing, and forbearing guide.

By way of preface to what follows, it may be stated that the Southall station has a total productive capacity of rather more than 8 million cubic feet, of which roundly 5,750,000 cubic feet is coal gas, and 2,800,000 cubic feet is carburetted water gas. In the half year ending June last, 35,483 tons of coal were carbonized, and the oil used was equivalent to a further 11,732 tons—making together 47,215 tons. The production of gas was 505,814,000 cubic feet. In the December half of the year, the coal carbonized was 33,613 tons, and the oil used was equivalent to a further 12,502 tons—making together 46,115 tons, from which 503,074,000 cubic feet of gas were produced. But let it be clearly understood before we proceed that the foregoing and all other figures given in this article refer only to the Southall station, and do not include the Company's Brentford works. With these general particulars in our possession, we will follow the visitors over the course they were taken by Mr. Bugby. A few steps from the works office brought them to the carburetted water-gas plant, in explaining the working of which Mr. Bugby received valuable assistance from Mr. Cutler, jun. The plant is housed in a huge building constructed of steel, with corrugated sheet covering; and into the boiler-room of this structure the members were first conducted. There they saw three double-flued Lancashire boilers (working at 120 lbs. steam pressure), 7 feet diameter and 24 feet long, fitted in two cases with Grainger's forced draught, and in one with Meldrum's, for burning breeze. The feed-water heater here used was also examined. Passing into the engine-room, the members seemed to be highly delighted with the varied machinery which met their gaze. They devoted some considerable observation to the two Tangye high-speed compound vertical engines, driving Sturtevant fans (2000 revolutions per minute). The fans are sunk in pits, and are protected with wire guards and hand railing. The boiler feed-pumps and the oil-pumps did not pass unnoticed. The latter are duplex, working at reduced steam pressure. They are continuous running, and during the "blow" the oil relieves itself through relief-valves back to the suction-tank. The use of the circulating water-pumps and the exhausters was also inquired into. All the machinery is in duplicate; one set being for reserve purposes. A cast-iron overhead tank forms the roof for the entire engine-room. In the generator-house, the members were introduced to four sets of plant, each having a productive capacity of 700,000 cubic feet per twenty-four hours, or altogether 2,800,000 cubic feet. Two of the sets, we may stop to mention, were erected in 1898, the third in 1899, and the fourth in 1900. The house is fitted with a steam-lift, in a central position, for raising the coke buggies from the coke-store on the ground level to the operating-floor, which is constructed of chequer plates. On the members assembling on the operating-floor, the whole process of production was fully explained and demonstrated. The visitors were particularly interested in a novel form of oil-sprayer, just fitted by Messrs. Cutler, to get over the difficulty of the burning away of the sprayer during the blow. The action of turning the oil on and off actuates a lever, which raises or lowers the sprayer through a stuffing-box on the carburettor top manlid. The sprayer is connected by a flexible metallic tube to the fixed oil-supply pipe. The members witnessed a number of "runs," and inspected the various details of the plant. On leaving the building, they viewed the supplemental apparatus, including the tar-separator, the condensers, condensing-main, relief holder (70 feet diameter and 20 feet deep), oil storage tanks (equal to the accommodation of 2000 tons of oil), and the range of four purifiers (30 feet square) for dealing with the water gas. In the latter, the only material used is oxide, about which a further remark will be made presently. But in completing this cursory notice of the plant itself, it must be said that throughout it bears evidence of careful and thorough construction from its main features down to the smallest details, and the whole of it presents a very business-like appearance.

In connection with the water-gas plant, we have a few figures which Mr. Bugby communicated, and which tends to bring out pointedly an important fact in considering the efficiency of a plant of this character. The figures refer to the past half year. In that period, 2·89 gallons of oil were used per 1000 cubic feet of gas made; and the average illuminating power of the gas was 18·77 candles, which gives 6·49 candles per gallon of oil. Now at Southall, the water gas is purified by oxide alone; so that the carbonic acid is not removed. It follows therefore, as 1 per cent. of carbonic acid reduces the illuminating power by 0·66 candle, and as the carburetted water gas contains 3·2 per cent. of carbonic acid, that this is equivalent to 2·1 candles. If this 2·1 candles is placed to the credit of the carburetted water gas (as it ought to be when making comparisons with works using lime), a very considerable difference is shown. Thus adding the 2·1 candles to the 18·77 candles, we get roundly 20·9 candles; and, dividing this by the gallons of oil used, we find the candle power would have equalled 7·22 per gallon of oil used over the half year, which is admitted to be a remarkably good result. The coke used per 1000 cubic feet of gas is 37 lbs.; the breeze consumed under the boilers, 13 lbs.

After spending an instructive hour about the water-gas plant, the members walked through the main part of the works to the retort-houses, passing on their way the steel skeleton of a large retort-house, which has been constructed by Messrs. Cutler and Sons, and which is destined for an installation of inclined retorts equal to the production of 2 million cubic feet of gas per day. The dimensions of the house are: 50 feet span, 250 feet long, and 40 feet to eaves. The roof consists of 27 principals. When the party arrived at the inclined-retort houses, we remembered that we were standing before the English nursery of the inclined retort system. For here it was that Mr. Frank Morris (the predecessor of Mr. Husband, and now one of the Directors of the Company) set up his first installation of inclines, after his historical visit—for so it may be described—to M. Coze at Rheims, from whence he came smitten with the idea that the "angle of repose" was the correct thing for the gas engineer to adopt in his manufacture. The ups and downs of the system during several subsequent years flashed across one's mind; but we recollected how, stedfast to his first impression, Mr. Morris had pressed on. What if he had not done so? It is not too much to reply that the system would never have attained the position it occupies in this land to-day. Horizontals are fast disappearing from the works of the Brentford Company. At the Brentford station inclines only can be found; and at Southall, there is only one house of horizontals which is used in the middle of the winter for two or three weeks. And we can see those horizontals as they become worn out going the way of those which, before that visit to Rheims, equipped the other houses. In one of the inclined houses, there are 18 settings of sixes, 20 feet long, and 24½ in. by 14 in.; and in the other, 26 settings of sevens, 15 feet long, 21 in. by 15 in. One figure shows the Company's justification for discarding the horizontals in favour of the inclines. Comparing the working at Southall with inclines and horizontals, it is found that there is a saving in wages alone of 1s. 4½d. per ton of coal carbonized; and by the machinery used in

connection with the inclined-retort houses (after allowing for everything in the nature of repairs, labour, &c., on the machinery) a further saving of 3d. per ton is effected. Thus the two together —the inclines and the machinery—produce an economy of 1s. 7½d. per ton. This being the Company's experience, it is not to be wondered at that the Engineer has decided to furnish the new house on the same system. With regard to the saving of 3d., it may be explained that the coke as it falls out of the inclines is quenched, and thrown on to a conveyor, which carries it away to the screens, and deposits it direct into the railway trucks, without being touched by hand.

But to return to Saturday's inspection, the visitors were taken into the house containing the eighteen settings of inclines; and there the simplicity of the charging and drawing operations were demonstrated to them. Then the party were taken to see the house of horizontals, which were not at work, but this enabled them to pry a little more closely into the mysteries of the heating of the settings than they would have been able to do otherwise. Then the conveying machinery and the coke-screens came in for scrutiny. It was gathered from Mr. Bugby that the conveying plant was supplied by the Chain Belt Company, of Derby, that it had been in operation in the case of the old inclined-retort house for something like ten years, and that it had given him every satisfaction. Examples of most of the other plant on the works were inspected. The process of purification was explained; and incidentally it was remarked by Mr. Bugby that a Weck's valve which he has had in use two years has discharged its functions faithfully, and has given no trouble. Hard by it was observed that a new "Standard" washer-scrubber by Messrs. Kirkham, Hulett, and Chandler, Limited, is nearing completion. The gasholders, of which there are four, were stated to have a combined storage capacity of about 7½ millions; the largest one being equal to just under 4 millions. The engine and exhauster room completed the round of the establishment.

Outside the works office, the President of the Institution (Mr. Percival Marshall) expressed the thanks of the members to the Directors of the Company, to Mr. Husband, and to Mr. Bugby for their courtesy and attention; and a hearty farewell to the last-named gentleman brought to an end what the visitors one and all dubbed a really instructive afternoon. May they have many more of an equally interesting nature.

NOTES.

The London County Council Electric Tramway System.

Gas and Water Companies, and the public generally, should derive much comfort from the descriptions that have been recently published of the underground conduit electric tramway system about to be applied to three important South London lines by the London County Council. The method of construction proposed is very simple. In the middle of the tramlines a slotted rail is fixed, showing an opening of ¾ in. for the connection with the car. The main length of the conduit is a simple tube of nearly circular section, in monolithic concrete. Substantial cast-iron cross bearers are embedded in this concrete, at 5 feet intervals, and carry by a suspension attachment the continuous metals which convey the current. The "plough" attached to the car will make rubbing contact with these conductors. Describing the essential features of this construction, the "Engineer" remarks that its most blessed feature lies in the establishment of the principle of insulated returns—"a complete abandonment of all hankering after vagabond earth returns." In fact, the return conductor is of iron, and has a section of 2¼ square inches. This is enough to provide for 270-horse power at the ordinary tramway pressure of 500 volts. This conductor is of five times the capacity of the usual overhead trolley wire. The danger of leakage of current should therefore be wholly obviated by this construction.

Coal Dust Fuel for Cement Kilns.

Many attempts have been made to apply coal dust as an industrial fuel to the heating of boilers, and other purposes. No very great or permanent advantage seems to have been attained so far in this way; but according to Messrs. Stanger and Blunt, who recently read a paper on "The Rotatory Process of Cement Manufacture," before the Institution of Civil Engineers, coal dust fuel has been successfully used in this new process. In the old English method of portland cement making, large quantities of gas coke are used to burn the raw material into cement clinker; but if the rotatory process prevails, this market for gas coke will be closed. About 20 per cent., by weight, of fuel to clinker is required for working the old discontinuous wet process. It is stated that the manufacture of cement by the rotatory process is making headway fast in America—where, however, the so-called "natural" portland cement is much employed. The system is the invention of Messrs. Hurry and Seaman. The raw materials, consisting of a calcareous shale and limestone, are crushed, dried, finely powdered, and fed mechanically into rotatory kilns. These are steel cylinders, 60 feet long and 6 ft. 6 in. diameter, set on a slight incline, and capable of being rotated by suitable gearing. The fuel is powdered coal driven in by a blast of air through an injector burner at the lower end of the kiln. An intensely hot flame, readily controllable, is thus produced. The hot clinker falls out into a chamber through which the air-blast is forced; thus ensuring a recuperative action on the heat. It is stated that a large plant for treating wet cement materials in the same way is being erected in this country.

Causes of the Rusting of Ironwork.

A writer in the "Iron and Coal Trades Review" takes a very despondent view of the painting of structural ironwork, as usually done. He points out that the process of oxidation of iron and steel begins while the metal is in the molten state, and is ever afterwards continuous. A coat of red lead or boiled oil is given to the metal before being shipped off, which is often done before the coating is dry. After passing through the workshop, the pieces receive another coat of paint, and are loaded up in trucks for transmission to the place of erection. Many of the pieces will hold water while lying flat on the waggon; and the small particles of coke ejected from the locomotive are deposited on the iron, and become embedded in the wet paint. The rain water, filtering through these sparks, and combining with the sulphur in them, produces an acid of sufficient strength to penetrate the film of paint, and so other dust spots are formed. After the job is finished, it is painted again—not too well. Although the cost of the labour in painting is usually several times that of the paint, not sufficient care is exercised to procure a good pigment. The boiled oil used is seldom good. The term has no real meaning. What is called boiled oil, is now commonly made by adding a few gallons of liquid Japan drier to every barrel of raw oil, which is then said, in factory language, to be "boiled through the bunghole." It is difficult to detect the adulterations of boiled oil.

Lubrication of Gas-Engine Cylinders.

It is a familiar observation that the consequential action of new inventions is often highly important. The classical example of this is the sewing machine, which necessitated a great improvement in the manufacture of sewing cottons. In the same way, the development of gas-engines is exerting a marked influence on the preparation of lubricating oils suitable for application to highly-heated bearings. The working temperature of gas-engine cylinders is constantly rising; and a lubricant capable of withstanding a dull red heat has long been demanded. Twenty-five years ago such a demand could not have been met; all the engine lubricants then in the market being of vegetable or animal origin. It now appears that still greater pressure is put upon the lubricating oil makers by the users of the small petrol gas-motors for autocars. Hot as stationary gas-engine cylinders get in working, these small motors become still hotter; because they have no water jacket. A De Dion tricycle motor, 3-inch cylinder, with 3-inch stroke, runs at 2000 revolutions per minute, and is only cooled by radiating flanges. A lubricating oil of very special quality is required for these engines; and this appears to be satisfactorily made by Price's Patent Candle Company. The difficulty is not that these mineral oils burn, but that at the high temperatures of the gas-engine cylinder they lose viscosity. An ordinarily heavy gas-engine oil at a temperature of 212° Fahr. may have its body reduced to that of ordinary kerosene at 60° Fahr.; when, of course, its lubricating properties may be found unsatisfactory. Price's new motor-cylinder oils have a flash-point of from 500° to 550° Fahr., and a viscosity of from 200 to 300 times that of genuine sperm oil at 70° Fahr.

The Tallest Chimney in the World.

Those of our readers who visited the Paris Exhibition will recollect the two ornamental chimney-shafts at either end of the machine gallery. They were erected in connection with the steam-generating plant, and afforded proof that the utility of such structures is not in the least interfered with by their being ornamental. Each shaft was 263 feet high, and cost about £8000. The new chimney at the Edinburgh Gas-Works, brought into use rather more than four years ago, is 250 feet high, and entailed an outlay of upwards of £4000. These were fairly tall chimneys; but they were stumps in comparison with one erected by the Royal Foundry of Saxony at Halsbrucke, in Freiberg, which is considered to be the highest in the world. According to some particulars given in the last number of "Le Gaz," it rises 460 feet from the ground, is 44 ft. 3 in. square at the base, and is 4 feet in internal diameter. In order that the gaseous products issuing from the outlet should cause as little annoyance as possible in the neighbourhood, the chimney has been built upon a hill, the top of which is about 200 feet higher than the plain in which the works are situated. Consequently the smoke and gases are sent into the air at a total elevation of 660 feet above the place where they are produced. The works being located at some distance from the chimney, they had to be connected with it by a shaft nearly 400 feet long, which had to be carried on a bridge specially constructed across the River Mulde, which flows between the works and the hill. The cost of the chimney alone was upwards of £6420; that of the shaft, £5200—making together, £11,620. It may well be supposed that very little money was spent on ornament. In the Paris chimneys, it may be remembered, ceramic bricks were freely employed, as it was desired to make the structures harmonize to some extent with the tasteful buildings of the Exhibition. The one at Halsbrucke was built of perforated bricks of radial form, made of highly refractory clay, and burnt at a temperature of about 2000° C., which imparted considerable hardness to them, and made them practically impervious to water. They were consequently well suited to resist the action alike of the acid gases within and the inclement weather without.

COMMUNICATED ARTICLES.

A MAJORITY IN FAVOUR OF DEAR COAL.

The experience of the past eighteen months of the effects upon individual, industrial, and national interests of a rise in the price of coal, would appear to have made no impression on the House of Commons. A term has been put to the period of exceptional prosperity which the country until recently was enjoying; the great iron and steel industries have been severely smitten; the cost of living has been perceptibly increased—all by the dearness of coal. Yet this is the occasion chosen by the people's representatives to accord a second reading to a measure which, it is admitted by its supporters, would permanently increase the price of coal. So little, indeed, does the importance of cheap fuel to the welfare of the nation appear to be understood by those elected to cherish that welfare, that the worthy member (Mr. Yoxall) who moved the second reading of the Mines (Eight Hours) Bill in the House of Commons—as was mentioned in the editorial columns of the "JOURNAL" last week—remarked that "he had been informed that an eight-hours day would not lead to an increased charge in the cost of coal of more than 6d. per ton"—just for all the world as if this were such a small matter that no one need trouble about it. Yet this increase in the cost of coal would impose an annual burden of nearly 5 millions sterling upon the coal consumers in this country, besides seriously handicapping the export and shipping trades.

The members who spoke in favour of the Bill failed entirely to make out any case for it. Indeed, Mr. Yoxall did really nothing more than demonstrate his failure to grasp the fundamentals of the subject. "He maintained that the high price of coal and the peculiar condition of the coal market during the past twelve to eighteen months, had not been in any respect due to the hours of labour or the high rate of wages." This is quite beside the point, which is that, if the hours of labour were now altered, the price would never fall back to the normal level, and that if the conditions had been so altered before the period of scarcity began, the scarcity would have been still greater, and the price still higher, than they actually were.

The advocates of this measure have never yet succeeded in demonstrating that the coal-mining industry so differs from every other that state regulation of the hours of labour therein is justifiable and necessary; and until they have done so, no ground exists for instituting regulation. The proposal to reduce the output per man, and so increase the cost of coal, is indeed singularly ill-timed, in view of the fact that our most formidable competitor, the United States, is, by the introduction of machinery, steadily increasing the output per miner, and has already a substantial advantage over this country in respect of the cost of winning coal. It is truly remarkable how the members of the House of Commons consent at times to be led by the nose by the labour "interest," for lack of the courage to say and do that which is right, rather than that which will win them favour with a noisy section of the electorate.

The excuse which a good many members would make for having voted in favour of the Eight-Hours Bill, would in all probability be that they knew no harm would come of their vote-cadging action, as there is no chance of the measure finding a place upon the Statute-Book. Fortunately, this is so; but that the proposal should, session after session, find a large number of supporters among those who, in their hearts, know it to be unnecessary, and contrary to the best interests of the community as a whole, is not creditable to the honour of the House. Mr. John Morley, when member for Newcastle, set an example by his uncompromising opposition to the Bill, which many of his supporters in the constituency favoured, that might well be followed by not a few of his fellow members.

There is, however, as already remarked, little fear of the Eight-Hours Bill surmounting the remaining obstacles in the way of its passage through the House of Commons; so that there is no need for coal consumers allowing anxiety upon that score to discount the pleasure with which they watch the steady crumbling away of coal prices. The demand for the class of fuel in which the readers of the "JOURNAL" are particularly interested is everywhere less than the supply; and the collieries are experiencing difficulty in finding customers at 9s. 6d. per ton f.o.b. Tyne. And last year odd cargoes were fetching more than twice this figure—which is still too high.

GAS: ITS USES IN INDIA.

By GEORGE CECIL.

India is by way of being a country in which improvement and progress are not much encouraged. What was good enough for the native's great-grandfather, is good enough for the latter's great-grandson. What was approved of by Job Charnock in the early days of Anglo-India, appears to be venerated by the latter-day European exile. In this connection, however, it may be observed that, although young Calcutta and Bombay find a difficulty in obtaining suitable garments from the Anglo-Indian *emporii*, the "palanquin" of two centuries ago has given place to the eminently modern victoria and brougham, though of antiquated shape and design. And even innovations of a more startling nature have taken place. In "hot weather," ice is obtainable at most of the hotels; and the streets of India's Metropolis are patrolled by imported English, semi-European, and indigenous Custodians of the Peace. But other equally necessary accessories to civilization are denied to the benighted Anglo-Indian and "Aryan brother." It is true that the steam-engine flourishes in India; and it is remarkable that the benefits to be derived from the use of gas are familiar objects in the East. But it must not be imagined from this that the latest developments of the art of gas-lighting are *en evidence* in India. Although a satisfactory plant is associated with more than one gas-works in England's most important Eastern possession, that of the works connected with native and indigenous enterprise is, it is rumoured, not always all that is desirable. The description of paraphernalia used by Van Helmont, Priestley, Macqueen, and later by Faraday, and more recently by Apjohn are said to be still in use in the laboratories of some of India's eminent gas-works managers—who are not necessarily English, or even Anglo-Indianized.

Although it cannot perhaps be stated, as an accurate fact, that the experiments of Pepys and Allen in connection with the absorbing properties of charcoal are still a novelty in scientific Anglo-Indian gas circles, it may be affirmed, with some truth, that the discoveries of Priestley, Dalton, Döbereiner, and Graham, in connection with hydrogen and oxygen, are, for the native Indian seeker after knowledge, to some extent tinged with novelty. It would also appear that the experiment of Faust, in connection with gases passed through a sheet of caoutchouc, command in Hindustan an admiration which has in England been relegated to the dark ages of science. However, India possesses a number of gas-works, and has also taken kindly to the gas-engine; and this is indeed evidence of the fact that the country inhabited by the Anglo-Indian and the Aryan has periodical fits of wakefulness—somnolent though it usually is.

While the inhabitants of India were engaged in internal strife, the useful combination of hydrogen and carbon was exploited in England by Henry. The Oriental warriors were therefore much too busy to avail themselves of the discovery. Some 230 years ago, Shirley was thought to have manufactured coal gas. But India was then bellicosely engaged, and was consequently unable to benefit by this departure. The erection of Murdoch's miniature gasholder in Cornwall in 1792 was, it is understood, chronicled in the Indian equivalent for "The Times" in the first half of the last century. In 1807 the obscurity of Pall Mall was dissipated by the introduction of gas. When in England this innovation had become a matter of ancient history, India awoke to the fact that the thoroughfares of its capital were none too well lighted. Subsequently, the Anglo-Indian and native inhabitants of Calcutta were surprised to find a gas-works erected in their midst. Bombay and Madras also were eventually blest in a like manner; while Lahore, Lucknow, Rawalpindi, and a few other of the native states followed suit.

It may be observed, in connection with the introduction of this branch of science into the realms of Aryan royalty, that the potentate sets up a miniature gas-works with a view to ingratiate himself with the Anglo-Indian Government, who will, he fondly hopes, reward his public spirit (?) with the "Commander of the Indian Empire" decoration—a distinction conferred upon natives who have learnt to read and write, and who are not openly seditious. The European element is also presented with it, though some of the latter have been known to decline the honour. However, the Orientals referred to deserve encouragement. It may also be said of them that they earn the gratitude of visitors to their capitals; for, when driving or walking through a native city, well-lighted streets are preferable to ill-illuminated thoroughfares. Such potentates apply gas lighting to their palaces and suburban retreats. Their public buildings are also thus lighted. In Lahore, Lucknow, and Nagpore, which are respectively the capitals of the Punjaub, North-West Provinces, and Central Provinces, the Government buildings are provided with oil-lamps but sparsely fed—and with an inferior description of oil. With the exception of Watson's Hotel, Bombay, which is provided with the electric light, the hotels in India's large cities are lighted by oil-lamps. However, in connection with the installation of electric light referred to, it may be observed that the light in question is dim—religious, and damnable. At the dining-table, one can hardly see to discriminate between gristle and gravy; while the reading-room, owing to the poorness of the illuminating power furnished, is, at night, quite misnamed. The Great Eastern Hotel, Calcutta, is provided with gas, and, should the burners be in good condition, the light is of a satisfactory nature. Unfortunately, however, at the caravansary named, the burners appear to be ancient retainers. The reading-room of the establishment is nightly filled with furious visitors, who, after a sojourn of some days, are apt to find a visit to the local optician necessary. A complaint to the Chairman of the Hotel Company, would probably result in a reply of the following nature: "Dear Sir,—If you sit nearer the light, you will see better." In India, among the Anglo-Indian contingent, intelligence is said to be unknown.

As a general rule, gas is not encouraged in connection with the lighting of large clubs; the indigenous "butti" (lamp) being in vogue. The streets, however, in a very few Indian towns, are associated, at sun-down, with that modern invention gas; while the bungalows of one or two sybarites in Bombay and Calcutta are lighted in the same manner. But such exceptions are, indeed,

rare. The Anglo-Indian seems to prefer a lamp which makes his fingers filthy, and his temper undesirable. One or two of the Indian railway companies are provided with gas-lighted carriages—the gas being manufactured at the company's own works; but the majority provide their passengers with wretched lamps in which castor-oil is burnt. The latter gives an inferior light, or absolutely no light of any description; while economical lines, which are bent on earning large dividends at any price, refrain from even lighting their lamps. No mercantile offices in India are lighted by gas; the commercial community being easily satisfied. What was approved of by Anglo-Indians in the year 1801, finds favour in the present year of progress Oriental.

The native Colossus of Finance, and the Aryan voluptuary, have been known to approach the local gas-works of one of the Presidency capitals, with a view to securing an installation in their palatial residences. Thus have they expressed themselves:—

Dear Sir,—

I proposes lighting my harem appartments with English gas, as used by His Excellency the Viceroy, for similar purposes. Kindly state per return what it will cost, including an Otto gas-engine to pump up my water. I want Bray's gas-burners and a superfine meter; and be quick in replying, for I am hurried. I will pay you very soon if you are cheap. Wishing you a happy life—I am, truly,

RAJAH OF MONKEYPORE.

Monkeypore, Jan. 1, 1901.

Dear Sir—

I am a poor fellow, and I wants to light my poor devil of a hut in the fashion of English sahibs. Now what will you take to do the job slap up? You do it quite low, and I will see that my Master, the Honorable Baboo Grish Chunder Mukerji, patronizes your distinguished firm for his domestic requirements of gas. I wants bunsen burners. You make the fine bargain, and I will ever pray for your prosperity and pleasures.—Your faithful,

BIHORI LAL.

Gas cooking-ranges are not precisely common in India; nor are grillers, restaurant ovens, gas-stoves, and gas-fires. The gas fitting, such as is necessary, is occasionally undertaken by practically any person desirous of turning an honest (?) penny. And should the operative who is engaged to perform the work be absolutely incapable, this detail will not deter him from posing as an expert. In India, the rupee, like the American dollar, is almighty; and many of those who earn it, if not incapable, are distinctly far removed from being adepts at their work. However, the Anglo-Indian employer is more than easily satisfied. Small wonder then that the employee, when subjected to a patron of this description, fails to be a success.

In France, Germany, and England, and in other civilized countries, gas companies are known to be fined for polluting a stream. In Hindostan such *contretemps* do not occur. The country in question possesses its own unapproachable and unequalled stinks—foreign odours, such as those which owe their existence to a gas-works, do not affect the olfactory nerves of the Aryan brother. The latter's Anglo-Indian cousin, it should, however, be mentioned, is singularly averse to the malodorous bye-products of the gas-works of India. Though not intelligent—judged from the standpoint appertaining to civilized countries—the Anglo-Indian is a clean person with a highly developed sense of smell. Should a dispute occur between a gas company and its clients, the matter would, very probably, as in England, be submitted to arbitration. In the East a vote has its monetary value.

The competition which in India once existed between castor oil and kerosene oil, and subsequently between the latter commodity and gas, is likely to continue; and since Hindustan is essentially a slumberous country, the more ancient system of oil lighting will be found hard to oust. Should an innovation possessing merit be introduced into a country, it is unlikely to meet with encouragement and success, unless the public to whom it is offered are possessed of an intelligent sense of improvement as well as advancement. Does India possess this desirable qualification? The English visitor, should he be of patriotic tendencies, will perhaps maintain a discreet silence upon the subject. The American tourist will not. It is possible, a century or so hence, that the Englishman domiciled in India's more important business, social, and official centres, will find a well-lighted club, an hotel reading-room in which it is possible at night to judge of the contents of the literary pabulum provided, and an office in which the final hour of his afternoon's labours need not be performed to the accompaniment of a poor light and its attendant language. Eventually, the amateur baritone, when warbling to Anglo-Indian audiences, may find the pages of "To Anthea" or "Dio Possente" illuminated by the rays emanating from a Scott-Snell self-intensifying gas-lamp, or needle burner. Lord Curzon's successor may, in the distant future, on alighting at the Anglo-Indian Euston, find a well-lighted platform awaiting him; while the Calcutta Gas Company's head fitter, should he be summoned to Allahabad to tinker the East Indian Railways Company's plant, will be able to make his way across the platform without barking his shins three times in as many yards. But—always a "but"—it does not do to be too sanguine. In the meantime, should the Muscovite succeed in overcoming the native regiments of Madras, he will possibly cause the capital of the Presidency to become a blaze of gas-light. Northern India, however, would not participate in this advantageous luxury; for the splendid Sikh regiments, and their capable officers, would probably form an impediment to the progress of any invading force. In the meantime, India is benighted in more senses than one.

TECHNICAL RECORD.

BOSTON (U.S.A.) COKE-OVEN GAS PLANT.

(*Continued from p.* 617.)

Charging.—The coal charge is brought from the bin to the ovens by an electric charging machine (not shown in the illustrations), and filled into the retort through three charging holes in the roof, A, A^1, A^2, figs. 6 and 7, p. 680. The coal is then levelled by introducing scrapers through small holes B, B^1 in the two doors C, C^1. When this charge is level, these holes are closed and luted, and the same is done with the three charging holes on top.

Removal of Gases.—The evolution of vapours and gases at once commences with the charging of the coal. By raising the drop-valve D, the products of distillation are permitted to escape through the stand-pipe E into the gas-collecting main F. It should be mentioned that this is a dry main, and not a hydraulic one. The mains are kept free of pitch by a tar-flushing system.

The gas from the Dominion coal (like all other coal) starts with a high candle power and fuel value; and as the coking process advances, the gas becomes poorer. The coke-oven receives its heat by burning a part of the gas freed of bye-products in a way described further on. With Dominion coal, the quantity of this fuel gas is one-half of the total gas produced. The quality of the surplus gas is materially improved by using the last fractions of the gas for heating the ovens. Consequently, two gas-mains F, F^1 are provided on top of the ovens, connecting the latter with entirely separate sets of condensing apparatus. The first "rich" gas escaping through the stand-pipe E is, after proper purification, sent to the consumers. When about one-half of the gas is driven off, the valve D is closed and the valve D^1 opened; and thus the gas is disconnected from the "rich" main F, and connected with the "poor" main F^1.

At present only the poor-gas system is completed, and all the gas passes through one main. The rich-gas set will be finished in a very short time, when the fractional separation will at once be put into use.

Heating System.—The heating of the oven is done in the following manner, based upon the Siemens regenerative system: The poor gas, after having been freed of its bye-products, is returned to the ovens through the fuel-gas main G, fig. 8. By means of the butterfly valve K, the current of gas may be directed to either side of the oven. Assuming it is going into the pipe H^1, figs. 7 and 8, then it will be admitted to the gas chambers L^1, fig. 7, under each oven wall through the tuyeres I^1. The gas is burned with air highly preheated. The air is supplied by a Sturtevant fan *Z*, fig. 8, which blows it through the Forter reversing valve U, fig. 9, into the bottom flue M^1 of the regenerator N^1, fig. 7. The air then rises through the highly preheated chequerwork, and enters through the port-hole O^1 into the air chamber P^1 (corresponding to P in fig. 6) under the bottom of the retort, with a temperature of about 1800° Fahr.

From the air chamber P^1, it passes through the small openings Q^1, into the adjoining gas chamber L^1, fig. 7, where it meets the gas coming from tuyere I^1. The products of combustion then rise through sixteen vertical flues R^1 in the side wall, because their course in the bottom flue is checked by the partition walls S. They unite again in the upper horizontal flue T^1, and having heated the one-half of the oven, pass over to the other half, descend through another set of sixteen vertical flues, pass through a gas chamber (corresponding to L^1 in fig. 7) and another set of openings (corresponding to Q^1 in fig. 7), air chamber P, and port-hole O, into the other regenerator N. They then give up the heat they retain on their downward course through the chequerwork, and arrive in the bottom flue M with a temperature of about 500° Fahr. They move from here by the stack-draught to the reversing valve U, figs. 8 and 9. This connects by means of the hood V, and the waste-gas regenerator M, with the stack-flue W. As soon as the Bristol pyrometer X in the flue W rises above 500° Fahr., an electric alarm bell indicates that the current must be reversed. The attendant throws over the lever for the gas butterfly valve K, fig. 8, and thus sends the gas through the pipe H to the opposite side of the entire block of 50 ovens. He also throws over the lever on the Forter valve, which places the hood V, fig. 9, in the position V^1 indicated by dotted lines.

The air coming from the fan *Z*, fig. 8, through the pipe Y, will then go through M, ascend through the regenerator N, burn the gas in L, adjoining P, fig. 6, and the products of combustion will fall into regenerator N^1, and go through the waste-gas flue M^1 into the stack-flue W.

This system produces a remarkably uniform heat in the ovens, as can easily be observed by looking into the retort when the coke is pushed (especially at night) and by pyrometric measurements. This is of great importance, as irregular heating would retard the coking operations in the cooler parts of the retorts. The result would be overheating in other parts, with consequent waste of gas and damage to the brickwork.

The supply of gas and air to each individual oven is once and for ever regulated at the beginning by means of small gas-cocks in the tuyeres I, I^1, and by means of fire-brick slides over the port-holes O, O^1. The result is that the regenerators show a very even heat from one end of the battery to the other.

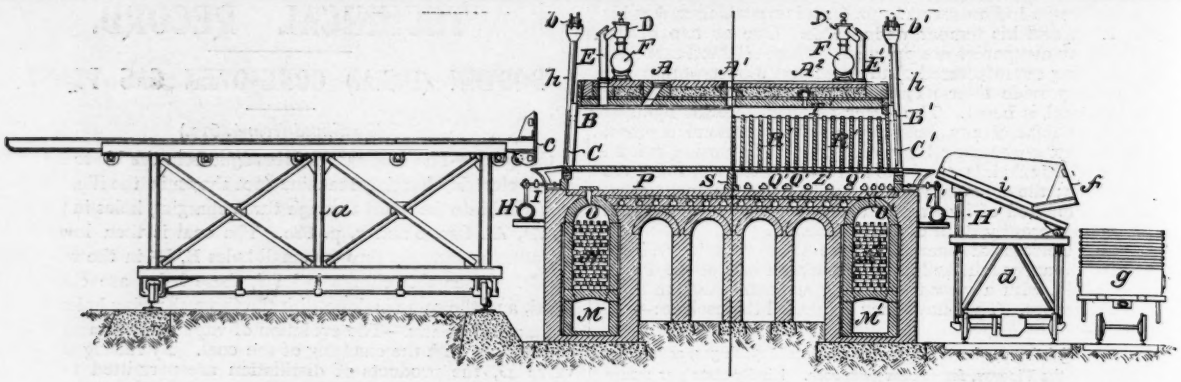


Fig. 6.—Section through Retort.

Fig. 7.—Section through Side Wall.

The Otto-Hoffmann Oven—with Pusher, Coke Loader, and Car.

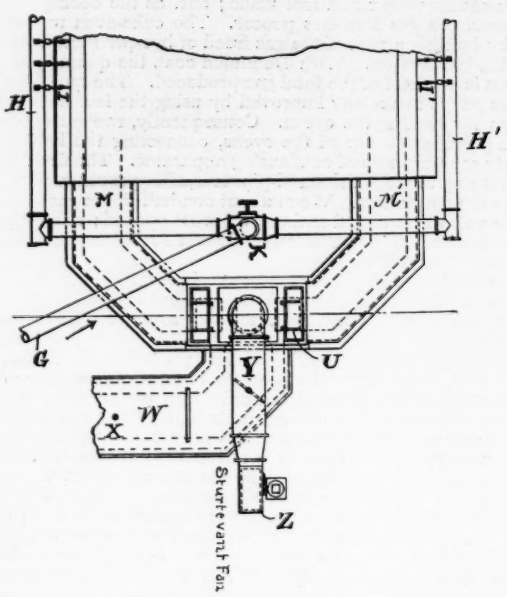


Fig. 8.—Plan.

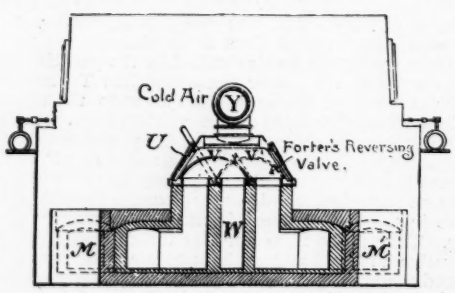


Fig. 9.—Section.

Reversing Valves for Ovens.

The combustion of the gases is almost theoretical—*i.e.*, the products of combustion show less than 1 per cent. of oxygen, and no carbon monoxide. Means are provided in the regenerators to at once locate an oven which is hotter or cooler than the rest.

The variations in the temperatures on top of the chequerwork of the regenerators, and consequently in the ovens, are very small. They have not been measured in Everett as yet, but are usually only about 50° to 100° Fahr. This variation is determined by two factors—viz., first, the size of the regenerator; and, second, the length of the reversing intervals.

I have described this heating system at length, as the great fuel economy of the Otto-Hoffmann oven is chiefly due to it.

Economy of the Regenerator.—It is generally denied by advocates of other retort-oven systems that the regenerator is such an economical feature as is claimed for it. A calculation of the saving of gas at Everett, due to the regenerator, will therefore be of interest. From the analysis of the oven-heating gas, we may calculate the volume of oxygen required for complete combustion as follows.

	Analysis of Oven-Heating Gas.	Volume of O_2 required for Complete Combustion.
C_2H_4	2·4	7·2
CH_4	29·2	58·4
H_2	50·5	25·3
CO	6·3	3·1
$CO_2 + N_2$	11·6	..
Total. . . .	100·0	94·0
Corresponding Volume of Air		454·1

For perfect combustion 100 cubic feet of gas require 454 cubic feet of air. To coke 1 gross ton of coal 5247 cubic feet of gas are needed (as will be shown further on in detail). The corresponding amount of air—viz., 23,820 cubic feet—weighs 1812 lbs., and would require 1812 × 0·2377 = 431 B.T.U. for an increase of temperature of 1° Fahr. The air is, however, heated by means of the regenerators to 1800° Fahr., which is an increase of at least 1700° over atmospheric temperature. The heat recovered from the flue gases and returned into the coke-ovens amounts, therefore, to 431 × 1700 = 732,700 B.T.U. for each gross ton of coal carbonized.

The oven-heating gas, according to the above analysis, has a heating value of 567 B.T.U. per cubic foot; and this amount of heat is, therefore, equivalent to $\frac{732,700}{567} = 1293$ cubic feet of gas for each gross ton of coal carbonized. On a capacity of 2000 gross tons of coal per day, the saving would amount, therefore, to 2000 × 1293, or in round figures 2,500,000 cubic feet of gas.

The economy of the regenerator is so clearly established that its size at Everett has been increased beyond that of all previous plants. The cost of doing so has been small.

Heating Ovens by Producer Gas.—The use of the regenerator is also of special advantage in case producer gas should be employed instead of the second fraction of the coke-oven gas for heating the ovens. The larger volumes of gases employed and produced in this case would make the waste of heat still larger; and thus the use of the regenerator becomes still more imperative.

The question of firing the retorts by producer gas has been carefully considered, because this would increase the elasticity of the plant as a gas-works. During the periods of large gas demand, the producers could be supplied with hot coke directly from the ovens; and all the coke-oven gas would thus become available. In other words, the gas output would be doubled.

Maintenance of Pressure Equilibrium in Retorts and Flues.—There is another advantage resulting from this system of heating: From the description already given, it is evident that when the gas is supplied through H^1 and the air through M^1, we have a slight pressure in the regenerator N^1. At the same time the flue M, carrying the waste gases to the stack, is under a slight vacuum. We, now, are able by a permanent adjustment of the fresh-air pressure (by means of a damper in Y, fig. 8) and the stack draught in the flue M (by means of a stack-damper in the flue W, fig. 8) to maintain such + in M^1 and such − in M, that the pressure in the entire flue system immediately surrounding the coke chamber is ± O. Consequently, no cold air can enter from the outside into the flue system. With all other oven systems, the flue gases are moved by stack draught; and consequently a larger *minus* pressure is maintained in the flue system by which an unnecessary amount of air is drawn in from the outside—thus reducing the fuel economy. Furthermore, gas is drawn from the retorts into the flues through small cracks and open joints, causing a loss of gas and bye-products, and endangering the brickwork by local overheating.

Furthermore, the exhauster suction on the gas-collecting mains of the Otto-Hoffmann ovens is regulated so that a pressure is maintained which is a trifle in excess of the pressure in the flues around the retort. No difficulty whatever is presented in maintaining this slight excess of pressure. It can be done by hand regulation, or automatically (as at Everett). What will be the

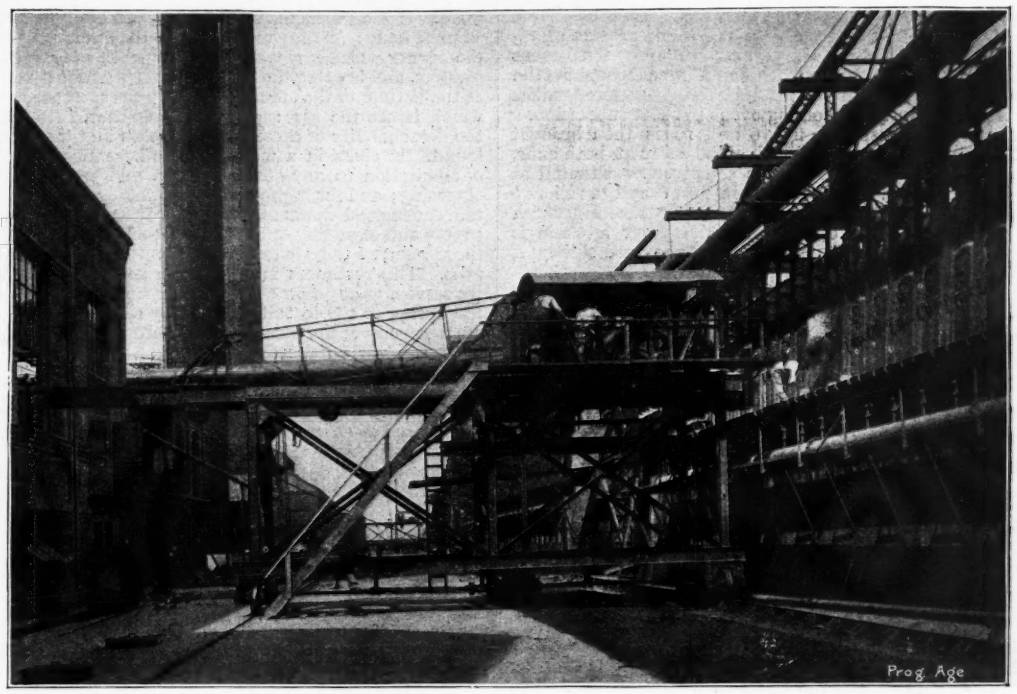


FIG 10.—COKE PUSHER IN POSITION AT BATTERY NO. 3.

result? In case of a slight crack or an open joint in the walls, no flue gases can enter the retort and reduce the value of the gas intended for illuminating purposes. And this is done without any appreciable sacrifice of bye-products or gas. This is the reason why the Otto-Hoffmann oven is able to produce high yields of coke and bye-products at the same time with a high surplus of excellent illuminating gas.

No other oven system can obtain similar results, as they all conduct the flue gases exclusively by stack draught. This disadvantage is especially apparent in the horizontal flue ovens, in which a high flue vacuum is required to overcome the resistance offered by reversing the current four or five times in the flues around the coking chambers.

Coking Time.—The charge of coal (6 net tons) is carbonized in from 24 to 30 hours. This time varies from several causes, among which is an important one—the character of the coke that it is intended to produce. If we wait until the last traces of volatile matter are expelled, then we produce a very hard coke, but require a long coking time. If, on the other hand, we push the oven before the last traces of volatile matter are driven off, then the coke is softer and better suited for domestic and boiler-firing purposes, and the coking time is materially reduced.

In the beginning, 60 ovens were pushed per day, out of the 100 in operation. With the growing demand for coke, this number was increased to 80 ovens. This corresponds to a coking time of 30 hours. But with this *modus operandi* a considerable number (from 20 to 30 ovens) are always "around"—*i.e.*, ready to be pushed. Thus, the coking could easily be reduced to 24 hours, and will be shortly with the increasing orders for coke.

Discharging of the Coke.—When the oven has ceased to give off gas, which can be ascertained through small holes in the doors, the valve D^1, figs. 6 and 7, is closed, and thus the oven is disconnected from the poor-gas main F^1. The charging-hole covers, A, A^1, A^2, are then opened, and the oven is ready for the coke-pusher.

In order to distribute the fresh charges over the entire battery,

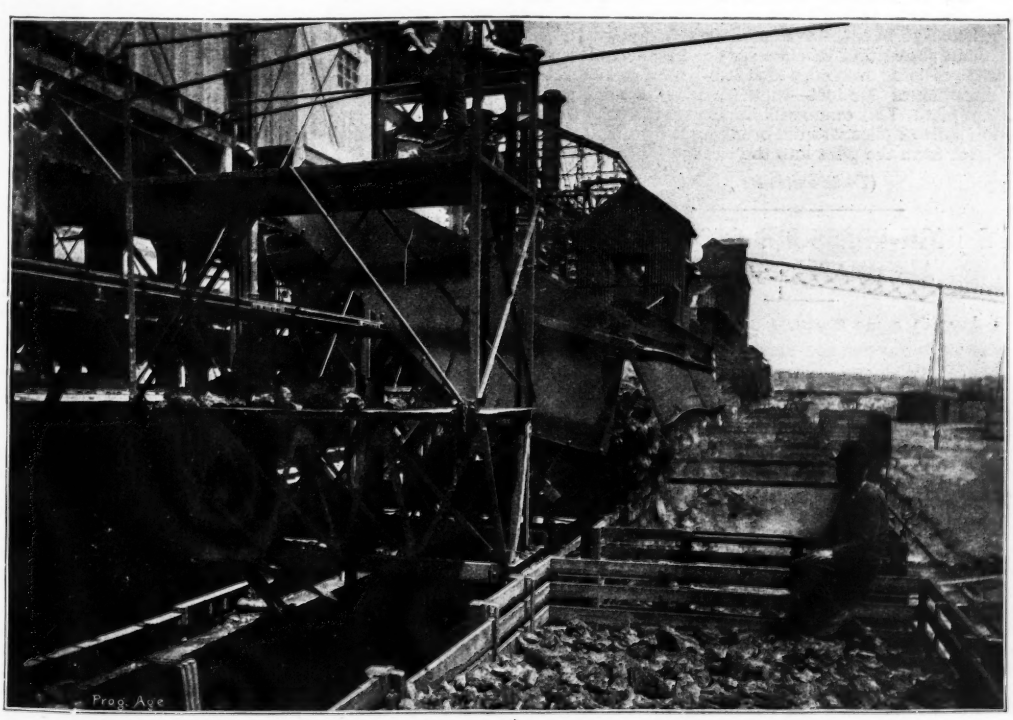


FIG. 11.—COKE LOADER DISCHARGING FROM BATTERY NO. 1.

a regular rotation of pushing the ovens has been established. Beginning, for instance, with oven No. 1 at one end of the battery, the next ovens are Nos. 11, 21, 31, and 41; after this, ovens Nos. 6, 16, 26, 36, and 46 are pushed. This is followed throughout the entire 100 ovens. It is apparent that such an arrangement makes it impossible to charge two adjoining ovens in short succession.

The electric coke pusher *a*, figs. 6 and 10, is then brought opposite the oven ready to be pushed. The doors at both ends, C, C^1, are hoisted by means of electric contrivances, situated at the end of each battery. As is shown in figs. 6 and 7, rollers *b* are provided over each door, on which a long bar is resting, which connects with the electric door hoist. Whenever a chain is attached to the door and to this bar, and the bar moved sideways, the door will be raised.

The electric coke pusher consists of a long rack and pinion, which is forced through the oven; a shield *c* bearing against the coke charge. Thus, the entire charge of coke is forced out towards the coke side. In order to facilitate the moving of the charge, the oven is a little wider at the discharge end than at the pusher side. The hot coke then falls into the electric coke loading machine *d*, figs. 7 and 9. A jet of water is thrown upon the coke immediately upon its leaving the oven.

The coke loader consists of a long, inclined pan *e*, capable of holding the entire charge of about 4½ net tons of coke. In order to obtain a good distribution of the coke in this pan, the entire machine is moved sideways while the coke is coming out. As soon as the charge is on the pan, this travels with its hot charge to one side; and a second loading machine finishes the operations at the oven. Thus the men are not exposed to the high heat from the glowing coke. The hot charge then receives another quenching. When the coke is fully cooled—partly by water and partly by the air—the pan is tilted, and the gates *f* are opened, which allows the entire coke charge to slide into the railroad cars *g*. Immediately after the coke has been pushed out, the pusher bar is withdrawn, and the doors C, C^1 are lowered. The doors are forced close against the brickwork of the oven by means of bars (held in buckstaves *h* between the ovens) and wedges. After this, the doors are sealed hermetically, by throwing loam around them; and then the oven is ready for another charge. The entire operation of discharging and recharging the oven is completed in about 10 to 12 minutes.

Disposal of the Coke.—All the coke coming from the oven is first loaded into railroad cars. The New England Gas and Coke Company own 150 cars, which are of improved open top-rack type. The capacity of these cars is about 22 to 25 tons. Provision is also made to load the coke into box-cars. The coke coming from the ovens consists chiefly of columnar pieces about 9 inches long. With these pieces is mixed a small percentage of smaller pieces. This coke is called "run-of-oven coke," and is shipped direct for use under boilers, locomotives, for metallurgical purposes, &c. If the coke is to be used for domestic purposes, the railroad cars are switched to a coke-crusher, by which it is broken into different sizes and screened. The different sizes are collected in separate bins, from which they are drawn again into railroad cars for shipment.

It is also mentioned above that the railroad cars can be shifted directly on to lighters which transfer the coke to any of the large coal yards, &c., in Boston. There are also provisions being made to load the coke in bulk into steamers and sailing boats. There is, furthermore, in construction a large storage yard capable of holding about 50,000 tons of coke for the winter trade; and a moveable crane is being erected, which has a span of 200 feet and travels a distance of 600 feet—thus covering a total area of 120,000 square feet. This crane will either load the coke from the cars on to the storage piles, without breaking it by a high drop, or will load it back from the piles into the cars.

(*To be continued.*)

KEITH'S HIGH-PRESSURE GAS-BURNER AND AUTOMATIC LIGHTER.

When in days to come students of gas matters read up the records referring to the rise and progress of high-pressure incandescent gas lighting in this country, they will find the name of Keith takes an honourable position among those who devised apparatus and effected improvements which carried gas up to the summit of brilliance and cheapness in artificial illumination. The automatic gas-compressors known as "Keith's" have alone established that name in the gas industry; and in the future there will not be anything surprising in finding the same name coupled up with the other portions of the appliances essential to the completion of an installation of high-pressure lighting. In saying this, we are on safe ground; for within the past few days, we have been shown a burner and an automatic lighter for high-pressure work, both of which are due to the ingenuity of a member of the Keith family, and both of which possess features of the kind which aid in the attainment of perfection in a system.

Treating of the burner first, we do not think it is claimed for it that its efficiency as a light-giving medium is superior to certain other burners of the same class when the latter are in a position in which their full efficiency can be developed; but its characteristics in other respects give to it an individuality which the gas engineer will appreciate. Fig. 1 shows the burner drawn to half scale. It is constructed in four easily detachable pieces—(1) The stem or body; (2) the gauze cap; (3) the outer casing to the top of the burner, which serves the double purpose of carrying the mantle support, and keeping the gauze cap in position; and (4) the part at the bottom of the stem which contains the cone, at the apex of which issues the gas supply to the burner. Now it is really in the detachability of these different parts that the improvement is found. It gives, in a manner to be hereafter explained, facility of adaptation to any quality of gas, and ease in repairing and cleansing; and for high-pressure lighting, which requires, to obtain the highest constant effects, ready and precise adjustment of supply and cleansing of the burner, such attributes of a burner as those referred to have only to be mentioned to show their usefulness. This readiness in adaptation renders the burner suitable for service in any district; for the air supply can be adjusted, with the burner *in situ* to suit any quality of gas—rich or poor. The stem or body of the burner screws into the small portion forming the base, in which there is a cone from the centre of which issues the gas. The cone is formed at an angle of about 45° to the centre line of the burner; and the body or stem of the burner is coned out at the same angle. Therefore it will be seen that, when the two parts are screwed together, there is a coned annular space left; and it is into this space that the air finds admission. Thus by screwing the stem up or down (which can be readily done by hand) the annular space is increased or diminished without alter-

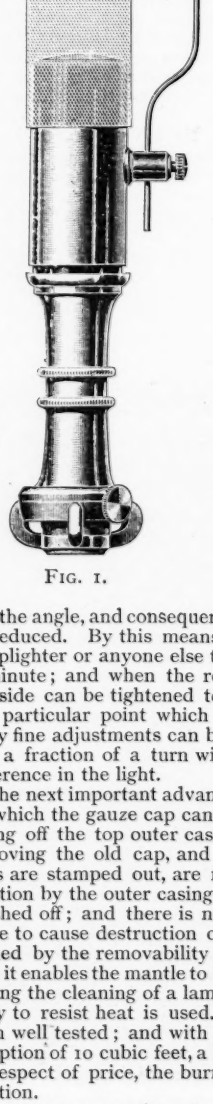


FIG. 1.

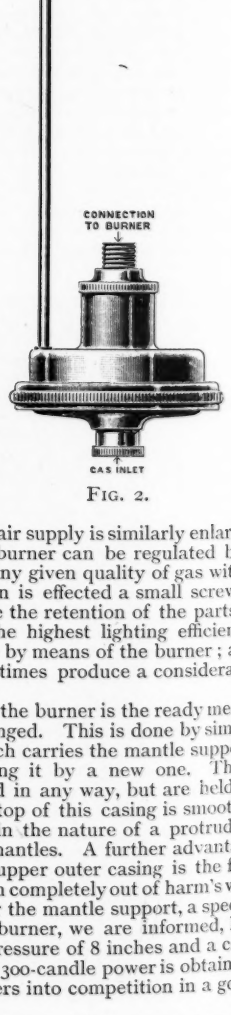


FIG. 2.

ing the angle, and consequently the air supply is similarly enlarged or reduced. By this means, each burner can be regulated by a lamplighter or anyone else to suit any given quality of gas within a minute; and when the regulation is effected a small screw at the side can be tightened to ensure the retention of the parts at the particular point which gives the highest lighting efficiency. Very fine adjustments can be made by means of the burner; and just a fraction of a turn will sometimes produce a considerable difference in the light.

The next important advantage in the burner is the ready means by which the gauze cap can be changed. This is done by simply lifting off the top outer casing which carries the mantle support, removing the old cap, and replacing it by a new one. These caps are stamped out, are not fixed in any way, but are held in position by the outer casing. The top of this casing is smoothly finished off; and there is nothing in the nature of a protruding ridge to cause destruction of the mantles. A further advantage gained by the removability of the upper outer casing is the fact that it enables the mantle to be taken completely out of harm's way during the cleaning of a lamp. For the mantle support, a special alloy to resist heat is used. The burner, we are informed, has been well tested; and with a gas pressure of 8 inches and a consumption of 10 cubic feet, a light of 300-candle power is obtained. In respect of price, the burner enters into competition in a good position.

Now we come to the automatic lighter for high-pressure burners

—the idea being to utilize it for the simultaneous lighting of whole series of burners from the point where the compressors are situated, or for lighting and extinguishing burners in inaccessible situations, by simply putting the compressors into or out of use. The little contrivance (which is illustrated in fig. 2) is intended to be inserted immediately under the burner, or one will suffice for a cluster of three burners. The arrangement consists of a small weighted diaphragm, which is acted upon by the gas, and which operates the valve which controls the supply of gas to the burner. When the gas is at the ordinary main pressure up to (say) 3 inches, it is not sufficient to lift the weighted diaphragm; but when the increased pressure comes on, by the bringing into action of the compressor, the gas is able to lift the weighted diaphragm—thus opening the valve leading to the burners. Provision is made for allowing a small quantity of gas to flow through a bye-pass to feed the igniting-jet during the time the gas is cut off from the burners; the amount of gas so passing being regulated by a small screw. When the diaphragm lifts, and the valve opens to the burners, the bye-pass is cut off, and consequently the jet is extinguished. Then when the compressor is shut off, the lowering of the gas pressure permits the weighted diaphragm to gently fall, and this cuts off the gas supply to the burners, and admits gas to the bye-pass for the igniting-jet. A simply operated igniter of this kind should be of great service in high-pressure lighting. It is by improvements in appliances such as those we have here described that the perfection of a system is ultimately attained.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

By permission of Mr. W. W. Woodward, the Engineer and Manager of the Salford Corporation Gas-Works, the members of the above-named Association were allowed the privilege of holding their meeting last Saturday in the chemical laboratory and testing-room connected with the main offices of the works in Bloom Street. This special arrangement, which was highly appreciated by the members, of whom there was a numerous gathering, afforded exceptional facilities for illustrating a very interesting paper which was read by Mr. F. G. Barber, of Salford, on "Some Analytical Tests Made in a Gas-Works Laboratory;" and the evening's proceedings were of more than ordinary interest.

In the unavoidable absence of the President of the Association (Mr. C. Berry, of Hyde), Mr. R. H. GARLICK, of Salford, the Vice-President, occupied the chair, and briefly introduced Mr. Barber, whose paper he had the opportunity of knowing would be found not only interesting but most valuable to the members.

Mr. BARBER then read the following paper:—

SOME ANALYTICAL TESTS MADE IN A GAS-WORKS LABORATORY.

It is with considerable diffidence that I venture to bring this subject before you this evening, as I feel sure that many of you may know as much about it as I do, if not more. At the same time, there are, I believe, some present who have not the advantage of a laboratory at their particular works, or, having the laboratory, have not the opportunity of working therein; and to them these notes may prove useful. As each of us has his own ideas about most things, if I give you some of mine, I can only hope they may prove interesting if nothing more, and that you will not consider your time wasted by coming here to-night.

At the outset, I take it for granted that each of you has at least a slight knowledge of chemistry, as, of course, I cannot go into details in describing these different tests, as to each chemical reaction, and so on; it would take far too long. Chemistry is as essential to a qualified gas engineer as a knowledge of construction and drawing, as, for instance, you cannot expect to understand, or be able to control, the system of coal carbonization, with its attendant worries of stopped ascension pipes, &c., unless you have a knowledge of the different chemical reactions going on in the retorts, the effect of different degrees of heat on their chemical composition, and so on. In designing a laboratory for a gas-works, several things must be taken into consideration. A room must be chosen in which the ventilation can be easily regulated. It must be light, and as free from vibration as possible. Another thing which is frequently overlooked is that, having got the room, it must be kept clean and tidy. Nothing is so conducive to slip-shod, inaccurate work as a dirty laboratory and dirty apparatus. Cleanliness and tidiness are two of the watchwords indispensable to every well-managed laboratory.

I will divide my subject matter under different heads as follows:—

(1) Methods of testing purified gas for impurities.
(2) Analysis of the bodies which rid the gas of its impurities.
(3) Analysis of coal gas.
(4) Analysis of bye-products.
(5) One or two special tests and pieces of apparatus.

Care should be taken that your chemicals and reagents are of the purest quality, if you want accurate results. The most important items of all are your standard solutions, which must be correct, or your volumetric tests are useless. These standard solutions may be bought from most dealers who supply chemicals; but it is as well to test them before using, and see for yourself that they are correct. For my own part, I always prefer to make up my own solutions, and then I know they are correct. But no matter whether you make them up yourself or buy them, it is necessary to periodically test them (say) once a month, as exposure to light affects many of them, more especially $\frac{N}{1}$ solutions of acids. Normal solutions, as you no doubt are well aware, are so prepared that one litre at 16° C. shall contain the hydrogen equivalent of the active reagent weighed in grammes, H = 1.

In making up standard solutions, $\frac{N}{1}$ H_2SO_4 is usually the starting point—49 grammes or 26·63 c.c. of 1·845 specific gravity acid made up to one litre with water being required; and the standardizing agent is usually freshly prepared sodium carbonate, Na_2CO_3. If one of your solutions is found to be slightly inaccurate, it may often be corrected by a small factor as follows: Suppose your acid solution is slightly strong, and it only takes 19·5 c.c. instead of 20 c.c. to neutralize 20 c.c. of a freshly prepared solution of sodium carbonate Na_2CO_3, the number of cubic centimetres of acid needed in any titration will require to be multiplied by $\frac{20}{19{\cdot}5} = 1{\cdot}025$ in order to find the number of cubic centimetres required if the acid had been of the correct strength; and this factor—1·025—should be put on the label of the bottle. Of course, if the acid is too weak, a corresponding factor can be employed.

(1) *Methods of Ascertaining the Purity of Purified Coal Gas.*—First and foremost, the principal use of a laboratory is to test the gas made on the works, both for its illuminating power and for the presence or absence of those bodies which have a deleterious effect on the gas when burned—I mean, of course, sulphuretted hydrogen, sulphur compounds, ammonia, and carbonic acid gas. I have an example of the Gas Referees' sulphur and ammonia apparatus on the bench; the only difference being that, instead of a jar filled with beads in the ammonia test, we use a Drechsel wash bottle to arrest any ammonia present—the gas bubbling through the $\frac{N}{10}$ acid solution, and the whole being then titrated without having to wash out the solution into a separate vessel. I do not think it is necessary to further describe this apparatus; you are probably all well acquainted with it. But I should just like to point out that, after filtering off the precipitate of $BaSO_4$ on to a filter paper, it is as well to add a few drops of silver nitrate, $AgNO_3$, to the filtrate in order to make sure that you have got rid of all excess $BaCl_2$ from the precipitate of $BaSO_4$. On adding the $AgNO_3$, to the filtrate, a white precipitate of AgCl indicates its presence. Another point is to be sure to take sufficient ammonium carbonate to begin with—2 oz., I believe, is the recognized quantity.

A useful check on the Gas Referees' sulphur test, and one that can be made in a very few minutes, is Harcourt's colour-test (example shown). Its action is as follows: The sulphur present in purified gas is chiefly in the form of carbon bisulphide CS_2. This gas is passed over heated platinized pumice, and in so doing converts the CS_2 into sulphuretted hydrogen, H_2S, and methane, CH_4. The gas containing H_2S is then led into a solution of a lead salt; and the intensity of colour imparted to the lead solution from a given quantity of gas as compared with a standard tint corresponding to a definite quantity of lead sulphide, gives us the amount of sulphur in the form of CS_2 present in the gas.

For estimating the carbonic acid in the gas, we use Hempel's apparatus. Having tried Bunté's apparatus, for this particular test, I prefer Hempel. It is fairly accurate, quick, and easily manipulated; and I find it quite satisfactory. A saturated solution of KOH will last twelve months or more, even when used every day. Where lime only is used for dry purification, the gas should contain no carbonic acid.

The presence of sulphuretted hydrogen is noticed by a prepared acetate of lead paper turning brown when exposed to the action of the gas. Gas as it leaves the works should be free from this impurity.

(2) *Bodies which Rid the Gas of its Impurities.*—Having now briefly mentioned the apparatus used in testing the gas itself as sent out from the works, for its purity or otherwise, we will turn to those bodies which help to rid the gas of these impurities—namely, oxide of iron, which removes the sulphur; ammoniacal liquor, which removes the ammonia; and lime, which removes the carbonic acid.

Oxide of Iron.—In buying new oxide for purifying purposes, it is most important to know the amount of sulphur the oxide is likely to take up. So that it is usual to test the different samples of oxide sent in for the amount of sulphuretted hydrogen they will each absorb. To do this, the oxide is first dried. A weighed quantity is then taken, and put into a U tube, and again weighed. A stream of sulphuretted hydrogen gas, H_2S, previously prepared in a Kipp's apparatus, is then passed through the oxide until it will take up no more. The U tube is then again weighed; the difference in weight being the amount of sulphur taken up by the oxide. The oxide is then revivified by forcing a current of air through the U tube, again weighed, and then more H_2S gas passed, and so on. In this way, by passing H_2S gas through each sample of oxide three or four times, you get a very fair idea of the absorbing power of the different oxides. I ought to add that one arm of each of the U tubes is filled with calcium chloride, $CaCl_2$, to absorb the water formed in the reactions going on in the oxide.

Eample: 19·753 grammes of dry oxide taken, 18·92 per cent. moisture found.

	1st Abs. Grammes.	2nd Abs. Grammes.	3rd Abs. Grammes.
Wt. of U tube + oxide (after) .	116·270 ..	118·540 ..	119·320
Wt. of U tube + oxide . . .	111·685 ..	116·930 ..	118·750
Wt. of H_2S absorbed. . . .	4·585 ..	1·610 ..	0·570
As 19·753 grammes were taken =	23·21 °/₀ H_2S	8·15 °/₀ H_2S	2·88 °/₀ H_2S
Total H_2S in three absorptions =	34·24 °/₀ H_2S.		

This was not a good oxide. It took up a fair amount in the first absorption, but afterwards fell off very much.

The following test of another oxide gave a much better result:

Moisture = 34·42 per cent

Percentage of H_2S taken up.	1st Abs.	2nd Abs.	3rd Abs.
	26·19 per cent.	11·46 per cent.	9·15 per cent.

Total three absorptions = 46·80 per cent.

All these percentages are calculated on the dry basis.

The percentage of iron in your oxide, and more particularly ferric oxide, Fe_2O_3, is, of course, of vital importance in choosing an oxide. Hornby gives both a gravimetric and volumetric method of estimating the ferric oxide. I prefer the latter. If you have your solutions correct, all volumetric tests are more accurate, and the chance of error is less. An average composition of a rich bog ore would work out as follows: Moisture, 30 to 40 per cent.; total iron, 60 to 70 per cent.; organic matter, 15 to 25 per cent.; silica, 4 to 6 per cent.; and alumina, 1 per cent.

Spent Oxide.—The estimation of the sulphur in spent oxide of iron is based on the fact that free sulphur is dissolved by bisulphide of carbon, CS_2; and on evaporating off the CS_2, the sulphur is left behind in the solid form, in which state it can be weighed. A certain quantity of the spent oxide is taken, dried, and the sulphur extracted with carbon bisulphide, as shown. When the whole of the sulphur has been extracted out of the oxide, the flask containing the sulphur is placed in a water bath and connected to a worm condenser. The flask is then heated; and, owing to the difference in boiling points between CS_2 and water—47° C and 100° C—the former is soon distilled over and collected under water in a beaker. In this way, very little CS_2 is actually used in each test; the majority being recovered and used again. After the CS_2 has been distilled off, the flask is disconnected and weighed; and the percentage of sulphur calculated. Bisulphide of carbon is highly inflammable, and should always be collected under water; care being taken only to heat the flask in the water-bath gently.

We use Rose's arsenic reduction tubes, instead of Soxhlet's extraction tubes, for extracting the sulphur out of the oxide. Soxhlet's apparatus may save a small quantity of CS_2 in the actual extraction. But as most of the CS_2 is recovered in any case, that is not a great matter, and they are rather awkward to manipulate—requiring special stands and clamps, &c.; whereas the tubes we use are handy, the first cost is much less, and they are quite satisfactory.

Example: 10 grammes of oxide taken.

Wt. of dish + oxide + H_2O	32·905		
,, ,, + ,, only	31·350		
	1·555	= 15·55 per cent. of moisture.	
Wt. of flask + sulphur	34·410	= 53·40	S on wet basis.
,, ,, only	29·070	= 63·23 ,,	S on dry ,,
Wt. of sulphur	5·340		

Ammoniacal Liquor.—This is chiefly tested in gas-works for the amount of ammonia it contains. It can be roughly estimated with a hydrometer; but as the hydrometer does not show anything with any free ammonia present in the liquor, owing to the specific gravity of liquid ammonia being less than water (only ·885), this should never be taken as a conclusive test, and a certain amount of the liquor should always be distilled. So many cubic centimetres of $\frac{N}{1}H_2SO_4$ are taken, and so much liquor distilled over into the acid, and the acid then titrated back with $\frac{N}{1}$ KOH; the difference in the number of cubic centimetres required being the number of cubic centimetres of NH_3 in the quantity of liquor taken. A little caustic soda or potash is added to the liquor in the flask, in order to free the "fixed" ammonia. We use Sheard's absorption bulbs for holding the acid into which the ammonia distils over. By being connected to the worm condenser, it prevents the possible escape of any ammonia as it comes over.

Example: 20 c.c. liquor taken.

35·00 c.c. $\frac{N}{1}$ H_2SO_4

7·80 c.c. $\frac{N}{1}$ KOH

27·20 × ·017 × 5 = 2·312 per cent. NH_3
= 8·97 ,, S/A
Twaddel = 5° = 10·658 or strength.

By the term "free" ammonia is meant those compounds of ammonia with such acids as carbonic and sulphydric which can be removed from their solutions by simply boiling them for a certain length of time. By the term "fixed" is meant those compounds which are not removed in this way, and where it is necessary to heat such solutions in presence of a caustic alkali or lime. The sulphide and carbonate are the chief "volatile" salts found in gas liquor; chloride and sulphocyanate the chief "fixed" salts.

Lime.—The percentage of caustic lime present in a sample of lime is a criterion of its purity. This is usually estimated by thoroughly slaking a weighed quantity of the lime, and then completely drying in a water oven and reweighing; the difference in weight being the amount of water necessary for the conversion of the caustic lime into hydrate, and from this the percentage of caustic lime can be calculated. A good lime should contain 90 per cent. of caustic lime. The lime when spent is of no further use for gas-works purposes, and is used often as a manure.

(3) *Analysis of Coal Gas.*—It is often useful to know the composition of your gas, especially in cases where there is a difficulty in maintaining the illuminating power at some distance from the works, and where the proportion of your light-giving hydrocarbons to your carbon monoxide (CO) and carbon dioxide (CO_2) is of importance in helping to remedy this falling off in illuminating power. About two or three years ago I spent some time in making analyses of the gas at different parts of our district. I used Hempel's apparatus and mercury as the confining liquid, as being easier of manipulation than any other form of apparatus; and with reasonable care and patience, I found it quite possible to get fairly consistent results. In using mercury, one of the greatest difficulties is to keep the pressure of the gas in the measuring tube the same as that of the atmospheric air. To accomplish this, Hempel has an ingenious arrangement (shown) for equalizing the pressure, which, after a little experience, is easily arrived at and manipulated.

Except for this and the carrying out of the explosion in the estimation of the hydrogen and methane, there is not much difficulty in making an accurate analysis; the necessary number of pipettes filled with the different absorbents of the correct strength being all that is required. The different gases to be absorbed, and the solutions for absorbing them, are as follows; the order given being that necessary in carrying out an actual experiment:

(1) Estimation of CO_2 by means of KOH solution.
(2) Estimation of O by means of alkaline solution of pyrogallic acid.
(3) Estimation of unsaturated hydrocarbons (C_2H_4, C_3H_6, &c.) by means of a solution of Nordhausen sulphuric acid $H_2S_2O_7$.
(4) Estimation of CO by means of solution of cuprous chloride in HCl.

Each of these solutions is put in a Hempel pipette, and the measuring tube containing the gas to be tested connected to each in turn; the difference in the reading before and after the absorptions being the amount of the particular gas absorbed.

In order to estimate the amount of hydrogen, methane, and nitrogen, it is necessary to convert the methane into carbonic acid, absorbing with KOH, and to convert the hydrogen into water, measuring the contraction. This is accomplished by exploding a certain quantity of the gas with about four times its volume of oxygen. To do this, a cylinder of oxygen is necessary; and also an explosion pipette. About 20 c.c. of the gas remaining in the measuring-tube, and about 80 c.c. of oxygen, are put into the explosion pipette; an induction coil connected; and a spark of electricity passed. In the explosion, the hydrogen of the gas combines with the oxygen to form water, and the carbon of the methane combines with the oxygen to form CO_2; thus forming a contraction.

$$CH_4 + 2O_2 = CO_2 + 2H_2O$$
1 vol. = 1 vol.

and $2H_2 + O_2 = 2H_2O$
2 1 2
3 vols. = 2 vols.

The resultant gases after the explosion are passed back into the measuring-tube, and the total contraction measured, the gases being now passed into the KOH pipette to absorb the CO_2; and as 1 volume of CO_2 is formed by 1 volume of CH_4 (as above), the amount of CO_2 found is also the amount of CH_4. Again, two-thirds of the contraction after the explosion, less the CO_2 formed, will give the hydrogen present in the quantity of gas taken; the difference between what is left and the original 20 c.c. taken being assumed to be nitrogen. In this way, you get a complete analysis of the gas.

I wish time would allow of my giving you fuller details, with actual figures; but I fear I shall have to content myself with one or two analyses which I obtained.

	(1)	(2)	(3)
Carbonic acid (CO_2)	2·40 ..	2·60 ..	2·70
Oxygen (O)	0·60 ..	0·50 ..	0·70
Unsaturated hydrocarbons (C_2H_4, &c.) .	5·00 ..	5·70 ..	5·40
Carbonic oxide (CO)	7·40 ..	6·60 ..	7·20
Hydrogen (H)	29·85 ..	42·15 ..	41·09
Methane (CH_4)	45·20 ..	36·41 ..	36·41
Nitrogen (N)	9·73 ..	6·50 ..	6·50
	100·18 ..	99·85 ..	100·00
Illuminating power	18·60 ..	19·32 ..	18·86

You will notice in these three tests, that in each case the percentage of light-giving hydrocarbons is in proportion to the illuminating power; the higher the power the higher the percentage of hydrocarbons.

(4)—*Bye-Products.*—Sulphate of Ammonia: It is not my intention to describe the working of a sulphate of ammonia plant. A paper might be devoted to that alone; but I must just touch on the analysis of sulphate of ammonia. So many grammes of sulphate of ammonia are dissolved in a known volume of water, and a certain quantity of the solution taken and tested for ammonia in the same way as in the case of ammoniacal liquor, by distilling

into a solution of $\frac{N}{1}$ acid and then titrating back with $\frac{N}{1}$ alkali; and from the percentage of NH_3 found, the percentage of sulphate of ammonia is obtained by multiplying by 3·882.

$$2NH_3 = (NH_4)_2SO_4.$$
$$34 = 132 = 3{\cdot}882 \text{ factor.}$$

The amount of free acid is estimated by titrating a solution of the salt with $\frac{N}{10}$ KOH or $\frac{N}{10}$ NH_4OH.

Analysis:

$(NH_4)_2SO_4$	97·010 per cent.
Moisture	2·450 ,,
Free acid.	0·276 ,,
Impurity	0·060 ,,
	99·796

Spent Liquor and Devil Water.—In the sulphate of ammonia plant it is very necessary to test the spent liquor as it leaves the stills, and the "devil water," as it is termed, which is the waste gases and steam from the saturator, after passing through a condenser, in order to check the working of the plant and see that you are not losing more than a fraction of your ammonia. This should be done every day, the tests being carried out in the same way as in estimating the ammonia in the original liquor; a very much smaller quantity of acid being necessary, as the amount of ammonia present is so slight. When the plant is properly working the spent liquor should not contain more than 0·1 per cent. of NH_3; and the devil water 0·05 per cent. of NH_3. I have often noticed that the devil water may contain considerably over 0·05 per cent. of NH_3 when analyzed, yet a turmeric paper show no discoloration when tested with it. Hence a turmeric test in this case is no criterion of the absence of ammonia.

Tar.—Most text-books on gas manufacture mention the subject and analysis of tar; and as my knowledge is somewhat limited—the tests I have taken being more for experimental purposes than anything else, as we do not distil our own tar—I will leave you to refer to them for further information. The same, to a great extent, might be said of cyanides. I have made a few tests with the liquor and spent oxide, in which bodies the Cn is chiefly present as ferrocyanides and sulphocyanides. A good method of estimating the cyanide as prussian blue, Fe_7Cn_{18}, is to add KOH to the liquor, having previously driven off all ammonia, or oxide (digested in water), and then adding a warm solution of ferric chloride (Fe_2Cl_6) acidified with HCl. Prussian blue, Fe_7Cn_{18}, is precipitated. The prussian blue is dried, ignited, and weighed as Fe_2O_3, from which the amount of Cn can be calculated.

(5) *Special Tests.*—Furnace Gases: The testing of flue gases for the presence or absence of CO and CO_2 respectively, as a check on the working, is another test frequently carried out; but to be of any use, it must be done regularly and systematically, each furnace being tested—an operation often impossible, owing to the length of time it would require. It is some time since I tested any of these flue gases; but to give you some idea of the results obtained, I will mention a few of the figures. Orzats apparatus was used, which is not unlike Hempel in its application; the gas being passed successively through the different absorbents necessary for absorbing the CO_2, O, and CO.

Furnace Gases Taken Below Secondary Air Supply.			Flue Gases Taken Before Main Flue.		
CO_2.	O.	CO.	CO_2.	O.	Co.
6·80 ..	Nil ..	25·40	17·60 ..	2·00 ..	Nil
5·10 ..	Nil ..	27·10	16·60 ..	Nil ..	0·80
5·40 ..	Nil ..	22·60	15·80 ..	3·00 ..	—
5·50 ..	Nil ..	28·10	16·20 ..	— ..	0·20
5·20 ..	Nil ..	30·60	16·40 ..	2·00 ..	—

Calorific Power of Gas.—I am sorry I cannot show you a calorimeter for taking the calorific power of gas. It seems likely that in the near future the heating power of gas will become of as great importance as the illuminating power; and already there are several instruments for this purpose on the market. Perhaps the best is Junker's Calorimeter; but on account of its cost and somewhat delicate manipulation, I doubt if it will ever be extensively used in gas-works. For ordinary working, Simmance's and Abady's calorimeter seems very suitable, and costs about half what a Junker's calorimeter does. I have on the bench a Thompson's calorimeter for taking the calorific power of coal or coke, which I shall be very glad to describe; and also one or two other pieces of apparatus, such as Harcourt's 10-candle pentane standard lamp, and a Fletcher Anemometer if any of you care to stay.

But in the meantime, I must bring these notes to a close. I have tried in a short space of time to cover a good deal of ground; and can only hope that, while being brief and to the point, I have made my meaning intelligible. The figures I have given in the different tests I have described have been taken from actual tests I have made; and may not in all cases agree with corresponding figures given in text-books.

During the reading of his paper, Mr. Barber illustrated and explained his remarks in a practical and readily understood manner by means of the various instruments employed in the laboratory for carrying out the analytical tests referred to, and by giving the details of a number of tests he had made in the laboratory.

Discussion.

The CHAIRMAN said they had listened to a paper which would be most useful to the members generally, especially those who were going up for examination. If any of them desired further information, Mr. Barber would be glad to answer questions.

Mr. CHANDLEY, in opening the discussion, said the members had received a large amount of very valuable information. He would, however, like to ask for some further information with respect to one or two of the experiments in testing oxide. With regard to the tests for ammonia, he did not see that it should be necessary to pass it through a condenser; he thought it might just as well be allowed to bubble over into the acid in a boiling state.

Mr. BARBER, having given some further explanation with regard to the oxide tests, stated, with reference to the ammonia test, that if they did not use a condenser they would require a long tube; and he thought it preferable to employ a condenser, though, of course, this was not absolutely necessary.

Mr. C. B. FRY said he also wished to ask for some further explanation with regard to the testing of oxide. He thought that a certain amount of moisture was requisite in using this material, and that it should be tested under the same conditions, not by the dry test. In his opinion the makers of oxide should be asked what percentage of moisture was requisite for obtaining the best results. He did not consider laboratory tests of much use.

Mr. BARBER replied to several other questions which had been asked, chiefly with reference to various tests, and gave more detailed explanations of certain of the experiments. With regard to oxide, there was, he said, very little difference in testing dry or wet material; the respective tests were simply a matter of convenience. The great use of the laboratory tests was that they enabled managers to compare one oxide with another, and determine their respective values, which was of importance when dealing with tenders from different manufacturers.

Mr. BUTTERWORTH moved a vote of thanks to Mr. Barber for his very valuable paper, and to Mr. Woodward for his kindness in allowing the members the use of the well-equipped laboratory-room in which they were assembled. The paper had been extremely interesting to him (Mr. Butterworth), as he was connected with comparatively small works.

Mr. HILL having seconded the proposition, it was heartily and unanimously adopted.

Mr. BARBER, in responding, said he had thought his paper would be rendered much more interesting and useful if they could meet in the laboratory of the Salford Gas-Works; and he was only too pleased that his efforts had been so appreciated.

Mr. WOODWARD said that such organizations as the Manchester and District Junior Gas Association were doing a very useful work for students; and it had given him the greatest pleasure to afford any facilities in his power for their meeting that evening.

The members afterwards spent some time in examining the various instruments and appliances in the laboratory, which were fully explained by Mr. Barber. Special interest was taken in the small experimental plant which has been put down for supplying gas to the burners under pressure, by Messrs. W. Sugg and Co.'s system, the effectiveness of which for illuminating purposes was demonstrated by a couple of cluster lamps outside the offices.

REGISTER OF PATENTS.

Gas-Stoves.—Clamond, C., of York Street, Westminster. No. 4526; March 9, 1900.

The principle on which this radiant heat gas-stove is constructed is that, to obtain the largest amount of such heat by means of refractory bodies, "it is necessary for the process of combustion to go on inside the radiating body itself, so that that radiating body may absorb as much as possible of the heat energy contained in the flame for the purpose of throwing it out by radiation."

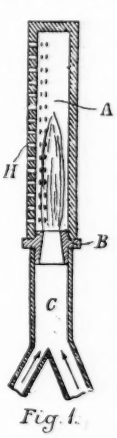
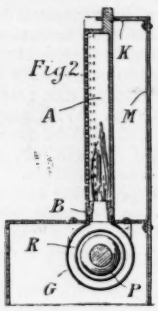
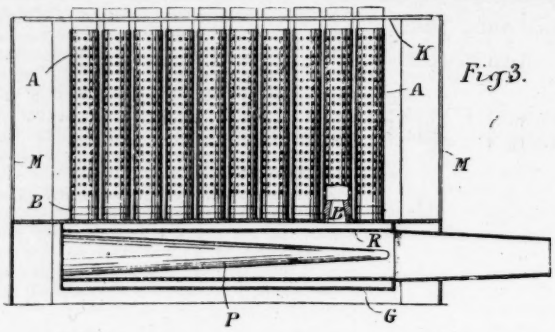


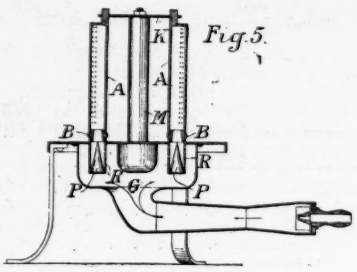
Fig. 1.

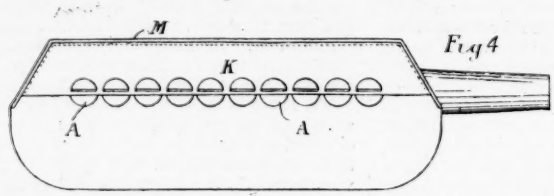
To accomplish this, according to one arrangement the patentee proposes to use a cylindrical tube A (fig. 1) of refractory material, closed at the top; the vertical part perforated by small holes H. This tube or cylinder is placed on a nozzle B, which is the outlet for a self-burning mixture of air and gas introduced by the pipe C. If the mixture is lighted at the top of the nozzle, it burns inside the tube, and the products of combustion escape through the holes H; and to obtain the best effect, the inside diameter of the tube should not be larger than the diameter of the flame. The heat evolved is absorbed by the walls of the refractory tube, except the part which escapes with the products of combustion through the holes, which are arranged on only one side of the refractory tube. This part becomes more incandescent than the rest of the tube, because the total area of the holes offers a very large surface to the flame; and in this way a maximum amount of the heat of combustion is absorbed by the refractory body.

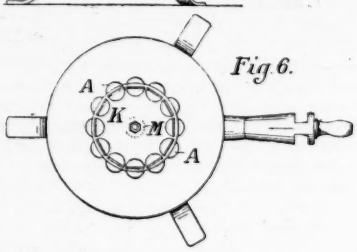
The patentee states that he is aware that tubes closed at the top and perforated at the sides have been used for burners in gas-stoves; but their function was to act as nozzles for the gaseous combustible—the mixture passing through the holes, and burning outside the tube, whereas according to this invention, on the other hand, the air and gas mixture burns inside the tube, and the holes therein serve only to allow the products of combustion to escape. As in the tubes so used prior to the present invention, the gas burned outside; it was only in slight contact with the material, and could not produce the results which are said to obtain with this arrangement.











In its practical form, the tubes A are made of fire-clay, and fixed in a straight line (figs. 2, 3, 4), if the radiator is to be placed before a chimney, or circular if in the middle of the room—figs. 5 and 6.

To obtain a self-burning mixture, a bunsen burner-tube such as was described in patents No. 294 of 1897 and No. 30,831 of 1897 is used, in which a jet of gas, entering through a nipple, draws in sufficient air to produce a self-burning mixture. The mixture enters a chamber G, which contains a diaphragm R placed centrally inside. This may be made of a finely perforated tube, or a perforated metal sheet or wire gauze made into a cylinder. The combustible mixture arrives at the interior of this diaphragm, and filters through the small holes, expanding in the annular space between the diaphragm and the chamber. Upon the chamber are fixed the nozzles made of refractory material; and upon these rest the tubes, which are perforated only in front. The tubes have on top a projection for the purpose of being fixed in the holes in a metal sheet K, so as to keep each tube in the proper position. The tubes are placed side by side, but without touching—leaving a little space between each pair.

The action of the whole is as follows: The mixture of gas and air burns in each of the tubes A, and brings it to a high heat. The air between the tubes and the reflector M becomes heated very rapidly, and then passes through the spaces between the refractory tubes. As practical experience shows that there is always a slight excess of flame (which passes through the upper holes of the tubes), the air which becomes heated by passing behind the tubes and in front of the reflector comes in contact with these flames as they issue, and effects a complete combustion, and so "reduces the smell often observed in gas-stoves when combustion is incomplete." The reflector also has the effect of throwing-back upon the tubes the heat radiated on the side directed to the reflector. To effect a uniform distribution of air and gas mixture to the several nozzles, inside the diaphragm R is placed a cone P, the point of which is turned towards the bunsen tube. It serves the purpose of diminishing the section of the annular passages for the air and gas mixture in proportion as it escapes through the nozzles "so that the volume of gas passing through each of the nozzles is equal throughout the whole chamber."

Except for the difference in shape, the stove shown in figs. 5 and 6 is the same as that previously described; and it is worked on the same principle. But there is a difference in the way in which the mixture of air and gas is distributed. The mixture comes from the bunsen tube into the chamber G, in which are fixed, at the bottom of the nozzles B, small cylindrical diaphragms of perforated tubes or wire gauze. Into these diaphragms cones P are introduced, with their points directed to the top. The mixture contained in the chamber G filters through the diaphragms, which all have the same surface and perforations, and therefore let through equal quantities of gas and air mixture. The cone P serves to keep up a uniform supply of the air and gas mixture to each cylindrical diaphragm, "as it increases the section in the same measure as the quantity of the gas and air mixture increases."

Incandescent Mantles.—Thompson, W. P.; a communication from Dr. W. Karsten, of Berlin. No. 5989; March 30, 1900.

This process for making incandescent mantles consists in mixing hydrofluoric acid with an aqueous solution of a thoric salt and a ceric salt, then impregnating suitable fabrics or tissues with the mixture, and drying and incinerating them.

In practically carrying out the invention, hydrofluoric acid is added to the concentrated aqueous solution of a thoric salt. The mixture is then heated for a short time; and to it is added an aqueous solution of a ceric compound—ceric oxalate is suitable. This salt is, however, insoluble in pure water; and, in order to dissolve it, it is necessary to add a small quantity of an organic substance—for instance, pyrocatechin. Or, the thoric salt and ceric salt may be first both dissolved in water (if necessary adding to this solution also an organic substance, such as pyrocatechin, to secure the dissolving of the ceric salt), and then the hydrofluoric acid added. In this case, no heating is necessary.

The proportions of the different compounds may be varied within rather large limits; but, as an example, the following proportions, which are said to yield excellent results, may be given:—

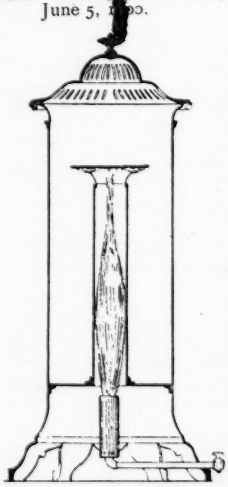
Thoric nitrate		59·4 grammes
Ceric oxalate	from 1·5 to about	2·5 ,,
Hydrofluoric acid	from 0·8 to about	2·0 ,,
Pyrocatechin (for dissolving the ceric oxalate)		3·0 ,,
Water		135·0 ,,

The patentee concludes his specification by stating that suitable fabrics or tissues are impregnated with this solution in the usual way—about 4 grammes of the solution being used for each fabric. The impregnated fabrics are then dried and incinerated in the ordinary manner. Now, by a merely mechanical action, the hydrofluoric acid renders the oxide skeleton very strong and elastic, while the use of ceric compounds instead of the cerous compounds, hitherto used, remarkably increases the illuminating power. Moreover, very strong tissues of fabrics—such as cotton yarn No. 50 and 60—may be used without deteriorating the illuminating power, whereby evidently the solidity of the mantles is again increased. The influence of the ceric compounds is a new and particular one, as may be seen by the proportions of thorium and cerium. A large number of photometric experiments have shown that, with the usual pressure and consumption of gas, the mantles yield an illuminating power of 105 Hefner candles, which tends, as a rule, to increase up to 115. After 800 hours' incandescence, the mantle is "still excellent in respect of illuminating power, form, and solidity." It may be mentioned that incinerated incandescent mantles may also be treated with hydrofluoric acid and ceric salts by immersing them in the solutions of these compounds; but "it is more rational" to impregnate the tissues with the aqueous solutions.

Incandescent Gas-Lighting Arrangement.—Jeffery, F. W., of Bradford. No. 6512; April 7, 1900.

The patentee claims: 1. In burners for incandescent gas lighting, a flexible supply-pipe and a yielding spring mounted to intervene between the pipe and the part of the gas-burner carrying the incandescent mantle. 2. A spring mounted within a box intervening between the part of the burner carrying the mantle and the other part which is supported by the bearings or gas-supply pipe. 3. Means whereby the lateral and vertical movements of a gas-burner carrying an incandescent mantle are allowed, by employing a spiral spring in the form of an obtuse cone, so that the coils can all be compressed into the same plane. The bottom of the spring may be supported upon the ordinary draught-plate, or a similar plate, on the bunsen tube; and the underside or the burner, or a collar thereon, rests upon the top of the spring. The collar and plate may be a sort of box enclosing the spring—one-half of the box sliding freely within the other.

Gas Heating-Stove.—Edgworth, T. F., of Bristol. No. 10,255; June 5, 1900.

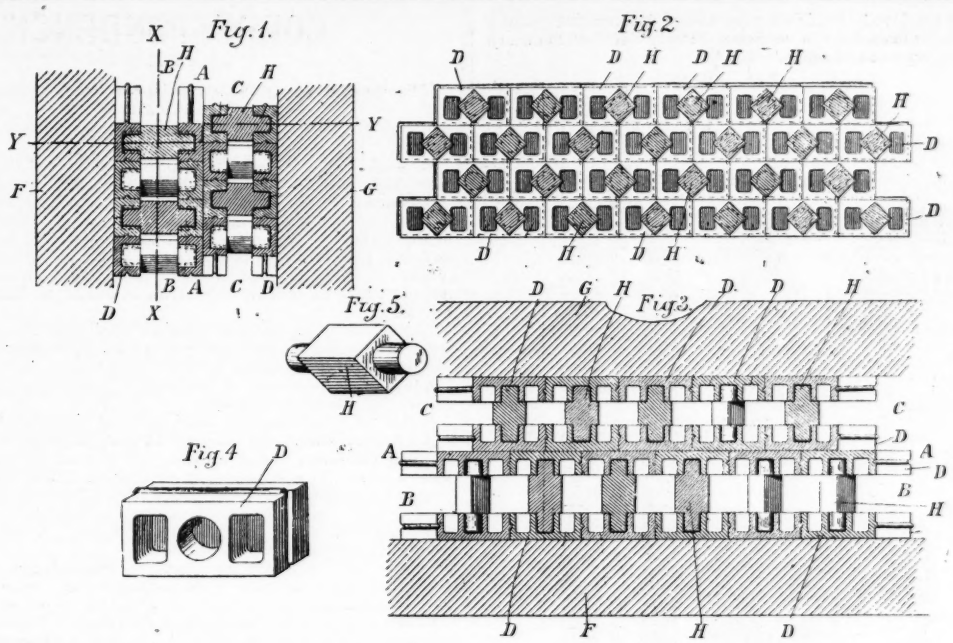


The patentee points out that in stoves at present in use—in which the flame is burned inside a cylinder or chimney—the chimney is made of such diameter in comparison with the size of the flame, that it is not heated to any great extent. He finds that, by enclosing the flame in a cylinder of almost the same diameter as the flame, "the cylinder becomes heated to a very considerable degree, and the flame may be considerably elongated—thus giving an increased heat-radiating surface." The hot cylinder also, it is said, prevents the formation of the carbon monoxide on the outside of a gas-flame, where it is in contact with the relatively cold air.

The invention, therefore, consists in enclosing an ordinary bunsen flame in a tube of metal or fireproof material, of such diameter and length that its inner wall is in contact with, or in close proximity to, the flame. The cylinder is fitted at its upper end with a baffle-plate, upon which the tongue of flame projecting through the cylinder impinges and spreads out. The arrangement is fitted into a stove-body of any suitable construction, as shown in the engraving.

Regenerative Retort Settings.—Gibbons, W. P. & G B. A., of Lower Gornal, Staffs. No. 2663; Feb. 10, 1900.

This invention, as applied to constructing the walls of regenerative furnaces for gas-retorts, is shown in the accompanying drawings, in

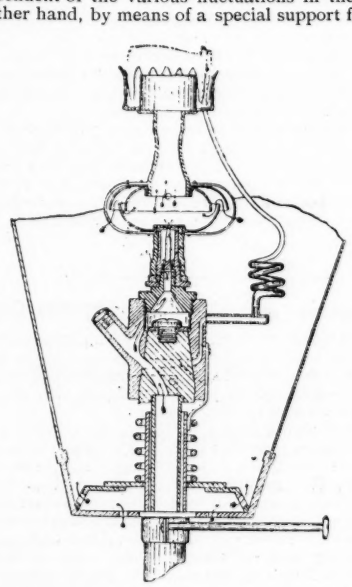


which fig. 1 is a cross sectional side elevation through the waste-gas and air passages at one side of the furnace; fig. 2 is a sectional side elevation on the line X of fig. 1; fig. 3 is a sectional plan on the line Y of fig. 1; fig. 4 shows on a larger scale one of the bricks of which the division-wall between the waste-gas and the incoming-air passages is built, and also with which the walls of the passages are lined; and fig. 5 is a separate view of one of the struts used between the division-walls and linings of the passages.

The division-wall A between the waste-gas passage B and the incoming-air passage C is built of the specially-constructed fire-bricks D, one of which is shown in fig. 4; and the walls F G of the passages are also lined with these bricks. Each brick is made with two deep recesses on the side, which forms the face of the passage; so that the waste gases are brought much nearer to the incoming air than if the bricks were solid. Each brick has a projecting longitudinal rib along one side and one end, and a corresponding groove along the other side and end; so that, when built together, the ribs take into the grooves of the adjacent bricks, and effectually prevent any bye-passing from the waste-gas passages into the air-passages, or *vice versâ*, through the joints of the bricks. Each brick has a central circular recess to receive the ends of the shouldered strut-bricks H (one of which is shown separately in fig. 5) which are provided between the division-wall and the lining-walls, so as to support the walls and lining. Each of these shouldered bricks (made with cylindrical ends of a size to fit into the recesses of the bricks D, and with an enlarged part to stretch across the passage) is of square or diamond section terminating in shoulders which abut against the faces of the bricks D.

Incandescence Gas-Burner for Street Lighting.—Murinick, A., of St. Petersburg. No. 13,734; July 31, 1900.

The object of this invention is to provide a burner which, on the one hand, is independent of the various fluctuations in the gas pressure, and, on the other hand, by means of a special support for the burner,



the shocks, &c., are diminished. It has, moreover, a special ignition-device, and means for speedily supplying the gas mixture; also a device for thawing the gas-pipe, if it should become frozen.

Inside the lamp is a perforated cone with a channel in communication with the supply-pipe. The cone is revolubly connected with a casing which possesses two channels. The channel C serves for conducting the gas to the burner, and liquid of any kind (alcohol, for instance) into the gas-pipe if it should become frozen. The groove in the channel through the cone is connected with a channel and a serpentine coil to provide the lighting-jet in the vicinity of the mantle. The regulator consists of a hollow cylinder, with a needle in the centre, and three or more holes in the bottom. Over it is screwed a hollow cylinder with an outlet aperture. The hollow cylinder is designed to receive a spring casing, which consists of baffles held together by a series of springs. The baffles are intended to ensure the escaping gas being completely and properly mixed with the air. The baffles carry a tube, which at its top bears the support for the incandescent mantle and a gallery for the chimney. A second tube is placed over the gas-pipe near the bottom of the lantern, and screwed fast to the casing. On the bottom are furthermore fixed a disc and spiral spring. This arrangement is for the purpose (during great variations in temperature, when the gas-supply tube expands or contracts) of equalizing the expansions arising thereby, so as to prevent the pipe breaking.

Incandescence Gas-Lamps.—Knopf, W., of Berlin. No. 21,074; Nov. 21, 1900.

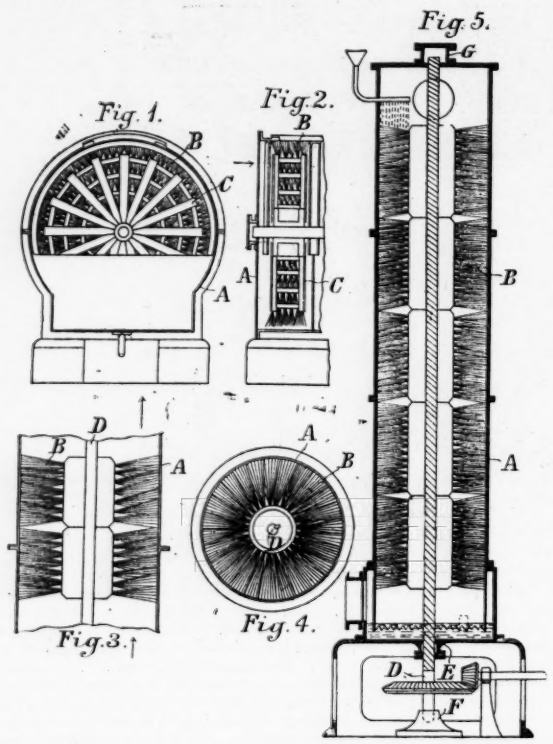
This invention relates to an incandescence gas-lamp having the appearance, when in use, of burning with an inverted flame, in which the gas is heated on its way to the burner by passing through the chimney. The gas-supply pipe (of small diameter) is screwed to the gas piping, and has as extensions branches that terminate in an air-tight chamber, from which, when a small screw is undone, the gas issues and flows mixed with air to the burner. In connection with the lamp, there is a device comprising an abutment located at the upper end of the gas-pipe, and adapted (when the gas-pipe is screwed in) to raise a ball resting on the union for the purpose of automatically closing the gas-piping when the lamp is unscrewed.

Gas Scrubbers and Washers.—Chandler, D. & S. B., of Brixton, S.W. No. 18,211; Oct. 13, 1900.

After intimating their knowledge of Anderson's rotary-brush scrubber (No. 2843 of 1875) and Midgley's somewhat similar arrangement (No. 2485 of 1884), the patentees proceed to describe their invention. It consists of a tank of horizontal form (and either circular or ⏢ shaped, in section), divided at its lower end into compartments in order to form water or liquor trays for different strength fluids. The tanks are either side by side or one above the other. The upper part of the vessel is unobstructed for the horizontal flow of gas, excepting that narrow flanges (fixed to the crown for the purposes of preventing any slip of gas) are provided, against which the brushes rub. A horizontal shaft upon which collars, forks, or spokes are placed, holds "discs" of brushes (corresponding in number with the liquor trays) in the usual way. The most essential part of the invention is said to consist in the fitting of the vertical revolving devices into the tower-scrubber cases, so as to "effect a large saving both in tank space and scrubber material."

It is well known to gas engineers (say the patentees) that a certain quantity of wetted surface is needed to be continuously exposed to the action of the unpurified gas, so as to purify a given quantity of gas per diem; and it follows that an outer vessel must be supplied large enough to contain the needful quantity of surface. "Therefore it will be understood that with horizontal washing devices, as at present working within divided vessels—wherein wheels comprised of several kinds of washing devices are used, working on a shaft—a large proportion of such washing medium is immersed in the various liquor tanks continuously, and a portion so buried (probably one-third of the total) under the water may be regarded as unproductive, although there. This being so, and taking into consideration the very much more costly tanks which have to be employed, this invention of occupying a vertical or tower scrubber case with efficient washing surfaces, to be wetted as they revolve, and so exposing to the action of the gas the whole of the

surface that is employed, furnishes a means of constructing such a vertically revolving machine at a very considerably less cost than any of the horizontal type can be made."



In fig. 1, A is a cross section of the tank, and B an end elevation of the brushes, held within spokes C. When revolving, these brushes are wetted in the purifying medium.

Fig. 2 shows a longitudinal side section.

Fig. 3 is a sectional elevation, showing the invention applied to the vertical form of washer-scrubbers fitted within a tower-scrubber case. In such a vessel thin boards or clusters of boards or equivalent washing revolving services would be used, as well as brushes. D is a vertical shaft passing through the devices B.

Fig. 4 is a plan of the brushes.

Fig. 5 is a sectional elevation of a fitted tower-scrubber, with an ordinary tar-extractor at the bottom. The shaft D passes through a stuffing-box E, and rests in a shoe F; the upper end being held in position by the cap G.

Incandescent Gas Lighting Apparatus.—Reitz, O., of Nuremberg, Germany. No. 23,642; Dec. 27, 1900.

In order to obtain a comparatively brighter light with a reduced consumption of gas with incandescent gas-burners, the patentee proposes to combine with the ordinary mantle a shade which prevents the heat from the burning gas escaping before it has been used for heating the mantle to a white heat.

The pin or rod supporting the mantle above the burner is prolonged at its upper end (as shown), and carries a disc or shade, which almost fills the interior of the chimney. When the burner is lighted, the shade retards the escape of the heated gases arising therefrom; the consequence being that the gases are burned inside or around the mantle, and "the latter is brought to a white glow or heat, and gives an increased light, at the same time requiring less gas to be emitted from the burner."

APPLICATIONS FOR LETTERS PATENT.

3956.—Gartrell, J. H., "Time regulator for gas-burners." Feb. 25.
3962.—New, A. G., "Internal combustion engines." Feb. 25.
4082.—Lüthi, A., "Acetylene gas apparatus." Feb. 26.
4086.—Brookes, A. G., "Governing the production or raising and lowering of gas-flames or other sources of light." A communication from S. A. Stewart. Feb. 26.
4111.—Clark, A. M., "Incandescent gas-mantles." A communication from the Süddeutsche Glühkörper-Fabrik J. Sauer. Feb. 26.
4121.—Roberts, J., "Gas-meters." Feb. 26.
4159.—Falk, Stadelmann, and Co., Ltd., and Thurnauer, L., "Incandescent gas-burners." Feb. 26.
4228.—Brett, C. G., and Henneberger, F., "Incandescent gas-lamps." Feb. 27.
4229.—Clamond, C., "Incandescent mantles." Feb. 27.
4264.—Powell, J., "Gas-furnaces." Feb. 28.
4265.—Powell, J., "Gas-producers." Feb. 28.
4302.—Mackean, W., "Burning and seasoning mantles." Feb. 28.
4323.—Besemfelder, E. R., "Manufacture of cyanogen compounds from gas mixtures containing ammonia." Feb. 28.
4349.—Westley, J., "Reducing valve." March 1.
4350.—Green, W., "Incandescent gas-burners." March 1.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Arsenic in Coke.

Sir,—May I add to my remarks on this subject at the meeting of the Manchester District Institution of Gas Engineers on Saturday last?

Wakefield is one of the centres of the malting trade, and hitherto most of our coke has been used for making malt. During the present winter, however, that trade has gone all to pieces; and upon making inquiries, I learnt that this was caused by the recent scare of "Arsenic in Beer." One large customer informed me that he could not use any more of our coke because, on having it tested, he found it contained arsenic.

This led us to get our coke carefully analyzed; the Analyst's report being as follows: "I have made a careful examination of your sample, and find faint indications only of the presence of arsenic. . . . The proportion of arsenic is too small to allow of any reliable estimation of the amount to be made."

Armed with this report, I called upon another maltster, who used to be a good customer. He said that he was practically compelled to give up using gas coke, as the brewers had decided not to buy any malt made with it. The brewers now gave them orders what to use; and they were compelled to obey. They were allowed to use anthracite or furnace coke, but not gas-works coke. I pointed out to him that both anthracite and furnace coke contained arsenic; but he said maltsters generally were powerless in the matter.

To show how this question affects the gas industry at large, I may say that, owing to this loss of the malting trade, I have been obliged to seek fresh markets for our coke, in addition to prematurely lowering the price so as to stimulate the local demand. I have also had to send over 1000 tons to London, where, of course, it has come into competition with the coke in that district.

All other gas undertakings whose sale of coke for malting purposes is stopped—for the stoppage is general—have in a similar way to get rid of their stocks (for very few gas-works possess much storage accommodation); so that it affects, in some degree, the whole gas industry.

A Royal Commission is now sitting in London to investigate the question of arsenic in beer; and I am decidedly of opinion that it will be most unwise on the part of the industry not to be represented at that inquiry—especially as the first witness called, the Medical Officer of Health for Manchester, was at once cross-examined as to the presence of arsenic in malt. He is thus reported—

> He could say that the amount of arsenious acid found in malt could not have produced the results observed. . . It was not certain, however, that a slow process of poisoning might not result from the amount of arsenic found to be present in malt. . . In the case of malt, the contamination was due to the deposit of arsenious acid from the fumes given off by burning coke or anthracite as it passed up through the grain in the process of kiln-drying.

Another inquiry is now proceeding on this matter—viz., the investigation by the Coroner of Liverpool into a death caused by drinking arsenical beer. In this case, an eminent Liverpool Analytical Chemist is reported to have said that "he considered the danger of arsenical poisoning from uncleaned malt was infinitesimal and hardly worth considering."

This witness will probably, in due course, appear before the Royal Commission; and if anyone were present in the interests of the gas industry to skilfully cross-examine him and other witnesses on this particular point, the future of gas coke for making malt might be saved; whereas if no such precaution is taken, only the worst aspect of the question may be presented to the Commission, and the malting coke trade may be permanently lost.

Since writing the above, I see from to-day's papers that further evidence was yesterday given before the Royal Commission on this subject. One expert is reported to have stated: "The bulk of the malt sold in this country was entirely free from arsenic. . . All malt could be made free from arsenic if gas coke was not used." Another stated that "he had found malt made in a certain way decidedly arsenical; the fuel used being a Yorkshire gas coke." This coke was certainly not Wakefield coke; but this evidence proves that, if any good is to be done at all, prompt measures are necessary.

Anthracite has been gradually increasing in favour for years for malting purposes; but furnace coke is quite a new rival, come in through this arsenic scare. It threatens to be a very formidable rival, too, not only for malting but general purposes, as it is being placed on the market at prices as low as, or lower than, gas-works coke; and it is to our interest to see that it has no undue advantage.

Wakefield, March 8, 1901. H. Townsend.

Gas Companies and Gas-Works Supplies Contractors.

Sir,—I have no desire to take up a position of antagonism towards any manufacturers who supply goods to gas companies, and if they will act reasonably, treat us fairly, and be content with good—I will say even handsome—but not excessive profits, no man can be less willing than I am to interfere with their trade.

The rings and combinations, however, are creating a feeling of distrust. For instance, only this week the engineer of a large company, dissatisfied with the action of the "ring," suggested the making of service-pipes by his company. This feeling will certainly grow, and result in very definite action if manufacturers are not wise in time.

I am led to write this letter because my reference to the price of gas-stoves at a recent meeting has caused some discussion in the trade—particularly my remark about 20 per cent. dividends. In this week's "Journal," p. 642, there are two paragraphs summarizing the reports of two gas-stove companies, from one of which I extract the following sentence (the italics being mine): "The profit for the year *after* strengthening the *internal reserves*, and charging . . . the expenses of amalgamation, and depreciation on the buildings and

plant, amounts to £44,324." It appears to have been appropriated, within £22, as follows:—

6 per cent. dividend on the preference shares . . .	£4,844
20 ,, ,, ,, ordinary shares . . .	27,600
Added to the reserve fund	10,500
Added to the undivided balance	1,358
	£44,302

The undivided balance to be carried forward is now £6569. Income-tax is paid by the company on the ordinary shares. The reserve fund now amounts to the high figure of £25 000, or nearly 20 per cent. on the ordinary shares, in addition to "internal reserves." The question arises, What is the purpose of this reserve fund if not to meet such extraordinary circumstances as those of last year? Instead, however, of drawing from the reserve, it has been added to very largely. This addition of £10,500 would have paid another 7½ per cent. on the ordinary shares. In fact, it seems that, had they so desired, the dividend might have been 30 per cent. The ordinary capital appears to be £138,000, and the preference £80,000—together, say, £218,000. The question naturally occurs, whether this is a reasonable capital for such a business converted into a company from private firms.

The other case on the same page of the "JOURNAL" is that of a private firm converted into a company last year. The profits accrued since the 22nd of May last were £14,151, disposed of as follows:—

Interest on purchase money	£2690
Dividend on preference shares	1456
8 per cent. dividend on ordinary shares . . .	2161
Carried to reserve fund	2000
Reduction of goodwill account	3626
Payable to directors and managers (presumably as a bonus on profits)	368
Balance carried forward	1850
	£14,151

Since my remarks above referred to at the Crystal Palace District Gas Company's meeting, one stove company has taken off the extra 7½ per cent. put on to meet the recent high price of iron. Others have reduced the 7½ per cent. to 5 per cent., which some engineers have declined to accept. It is said that contracts for iron were made at high prices last year; but we have not been told when these contracts expire.

I simply wish to state facts, avoiding comments as much as possible; but I think the above facts and figures deserve the attention of your readers, and there I leave them.

GEORGE LIVESEY.

March 9, 1901.

Incandescent Gas-Burners in Public Lamps.

SIR,—In these times, when the attention of gas companies is strained n the direction of giving the very best possible results in regard to public lighting, it is somewhat surprising to read (in your last issue) the remarks from a presidential chair as to how it is managed at Bradford.

The President is reported to have said it would probably cause a smile when it was known that ladders are solely employed to enable incandescent burners to be lighted in the town. The object is then stated—viz., that when a mantle is so distorted as to be incapable of being rendered incandescent all over, a saving of gas can be effected. The ladder enables the lighter to reach the cock, and by regulating it to allow only so much gas to pass as will render incandescent what remains of the mantle.

As I understand the object of Institutions is for the interchange of opinions between the older members and as an instruction for the younger ones, I cannot conceive it a laughing matter for such a proposition to go forward from the Chair to the members of any Institution. Gas companies have a splendid weapon in incandescent gas to meet all competition; but I hardly think the example advocated at, and carried out in, Bradford will be generally endorsed as being the best method of using it.

G. F. L. FOULGER.

Gaslight and Coke Company,
Goswell Road, E.C., March 7, 1901.

Geysers in Bath-Rooms.

SIR,—I have only to-day seen Mr. Richmond's letter in your issue of Feb. 26, in which he announces the fact that at last a solution has been found of the difficulties connected with the fixing of geysers in bath-rooms. Permit me to say that we have long since solved this difficulty; that I have fitted in my own house a water-heating apparatus, which circulates hot water to baths and lavatories, is exceedingly economical in gas, and gives no trouble of any description. This apparatus is fixed in the kitchen by the side of the range, with a flue attachment, and is connected to the ordinary flow-and-return pipes leading to the tank. Your many readers interested in this matter will have an opportunity of seeing the apparatus at work in the forthcoming Glasgow Exhibition.

A. P. MAIN.

Glasgow, March 8, 1901.

New Holder for the Middlesbrough Gas-Works.—At a special meeting of the Middlesbrough Town Council on Monday last week, the question of having a new gasholder, in view of the faulty condition of two of those now in use, was discussed at some length; and it was eventually decided to increase the storage at a cost of £45,000.

Wages of Newcastle Lamplighters.—The Directors of the Newcastle and Gateshead Gas Company have decided to grant the lamplighters the advance of 1s. per week asked for some time ago. They originally forwarded the request to the City Council; and when it came before the Committee dealing with affairs appertaining to the Company, the application was refused. Since then, however, the Gateshead Corporation agreed that the advance should be given to the lamplighters employed in that borough. The Directors therefore deemed it only fitting that the Newcastle men should have a similar rate of pay, and accordingly, on their own initiative, have granted the advance to them.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time: Bath Gaslight and Coke Bill, Chester Gas Bill, Elland Gas Bill, Faversham Water Bill, Newcastle-upon-Tyne and Gateshead Gas Bill, Newport (Isle of Wight) Gas Bill, New Swindon Gas Bill, Omagh Gas Bill, Shrewsbury Gas Bill, South Essex Water Bill, Stratton and Bude Gas Bill, Weston-super-Mare Gas Bill, Wisbech Water Bill.

The Rhymney and Aber Valleys Gas and Water Bill has been dropped.

Petitions have been presented against the following Bills: Aspatria, Silloth, and District Water Bill, Barrow-in-Furness Corporation Bill, Broadstairs and St. Peter's Water and Improvement Bill, Dover Corporation Bill, Faversham Water Bill, Handsworth Urban District Council Bill, Harpenden District Gas Bill, Harrogate Water Bill, Heywood and Middleton Water Board Bill, Leeds Corporation (General Powers) Bill, Leeds Corporation Water Bill, Omagh Gas Bill, Poulton-le-Fylde Gas Bill, Prestatyn Water Bill, Ripon Corporation Bill, Rugby Water and Improvement Bill, Salford Corporation Bill, Sheffield Corporation Bill, Smethwick Corporation Bill, South Essex Water Bill, Southport Water (Transfer) Bill, Stockport Corporation Water Bill, Stratton and Bude Gas Bill, Stratton and Bude Improvement Bill, Weston-super-Mare Gas Bill, Wisbech Water Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Aldeburgh Corporation (Water) Bill, Aldershot Gas and Water Bill, Bingley Urban District Council Bill, Blackburn Corporation Bill, British Gaslight Company Bill, Bury Corporation Bill, Colwyn Bay and Colwyn Urban District Gas Bill, Crawley Gas Bill, Derby Corporation Bill, Derwent Valley Water Board Bill, Devonport Corporation (Gas) Bill, Gravesend Gas Bill, Hartlepools Gas and Water Transfer Bill, Heckmondwike Gas (Transfer) Bill, Honley Urban District Council Gas Bill, Horley District Gas Bill, Ilkeston and Heanor Water Board Bill, Kettering Urban District Water Bill, Kingston-upon-Hull Corporation Bill, Leatherhead Gas Bill, Llandrindod Wells Urban District Council Water Bill, Mansfield Corporation Bill, Mond Gas Bill, Petersfield and Selsey Gas Bill, Rhyl Improvement Bill, Shipley Improvement Bill, South Metropolitan Gas Bill, Swanage Gas and Water Bill, Tees Valley Water Board Bill, Tendring Hundred Water Bill, Wallasey Improvement Bill, Wells Corporation Water Bill, Wells Water Bill.

Petitions have been presented against the following Bills: Aldershot Gas and Water Bill, Bingley Urban District Council Bill, Blackburn Corporation Bill, Burgess Hill Water Bill, Burton-upon-Trent Corporation Bill, Bury Corporation Bill, Colwyn Bay and Colwyn Urban District Gas Bill, Crawley Gas Bill, Cromer Water Bill, Derby Corporation Bill, Derwent Valley Water Board Bill, Devonport Gas and Coke Bill, Dorking Gas Bill, Gaslight and Coke Company Bill, Golborne Gas Bill, Gravesend Gas Bill, Hartlepools Gas and Water Transfer Bill, Heckmondwike Gas (Transfer) Bill, Horley District Gas Bill, Ilkeston and Heanor Water Board Bill, Kettering Urban District Water Bill, Kingston-upon-Hull Corporation Bill, Leatherhead Gas Bill, Llandrindod Wells Urban District Council Water Bill, Llandrindod Wells Water Bill, Long Eaton Gas Bill, Mansfield Corporation Bill, Metropolitan Water Companies (Amendment of Acts) Bill, Mond Gas Bill (among others, by the Bilston, Brierley Hill, Dudley, Willenhall, and Wolverhampton Gas Companies), Petersfield and Selsey Gas Bill, Rhyl Improvement Bill, Richmond Gas Bill, Rickmansworth and Uxbridge Valley Water Bill, Shipley Improvement Bill, South Metropolitan Gas Bill, Stroud Gas Bill, Swanage Gas and Water Bill, Tees Valley Water Board Bill, Tendring Hundred Water Bill, Wells Corporation Water Bill, Wells Water Bill, West Surrey Water Bill, Wolverhampton Corporation Water Bill.

The Borough of Camberwell have petitioned against the South Metropolitan Gas Bill, but do not pray to be heard.

The Gaslight and Coke Company Bill was down for second reading last Wednesday; but it was postponed till Thursday next. The Bill has been blocked by Mr. Lough.

The second reading of the London Water (Purchase) Bill was down for last Tuesday; but Sir F. Dixon-Hartland and Mr. Whitmore had given notice of their intention to move its rejection, and the matter was postponed till the 25th inst. Mr. M'Laren asked the President of the Local Government Board whether the Government intended to persist in their opposition to the Bill. Mr. Long said he did not see any reason for altering the views he had already expressed in regard to the matter.

On the same day, Sir Henry Fowler asked the First Commissioner of Works if he could improve the lighting of the inside of Palace Yard by adopting the system in use on the frontages to Parliament Square and Bridge Street—viz., incandescent gas-lamps. Mr. Akers Douglas said the introduction of the system referred to would involve certain alterations for which no funds were available.

Last Tuesday a Bill to amend the law relating to the liability of water companies for the storage of water was brought in by Mr. Sinclair, Major Rasch, Mr. Rentoul, Mr. Flynn, and Mr. A. Thomas; and also one by Sir Francis Powell, Mr. Wilson-Todd, Mr. H. Hobhouse, Sir John Dorrington, Dr. Farquharson, Mr. Brigg, Sir John Brunner, and Sir Walter Foster, to make more effectual provision for the prevention of the pollution of rivers and streams.

LEGAL INTELLIGENCE.

The Welsbach Company's Patent of 1893.

In the King's Bench Division of the High Court of Justice last Wednesday, Mr. Justice Channell had before him the case of *The Welsbach Incandescent Gas-Light Company, Limited, v. Krumm.* It was an application for an injunction restraining the defendant from infringing the plaintiffs' letters patent No. 124 of 1893 by the sale or use of mantles manufactured in infringement of that patent. The defendant, who did not appear, by his statement of defence, denied that he had infringed; but, alternatively, if it should be held that he had done so, he contended that the same were invalid by reason of the prior grants of patents No. 15,286 of 1885 to Carl Auer von Welsbach and No. 3592 of 1886 to Oliver Imray; want of proper subject-matter for a valid letters patent; and anticipation by the publication of the specification of the last-named patent. Mr. Fletcher Moulton, K.C., who, with Mr. Bousfield, K.C., Mr. T. Terrell, K.C., and Mr. A. J. Walter, represented the plaintiffs, said it was necessary for him to prove his case in Court, and establish the patent of 1893, in order that proceedings might be taken against the innumerable small infringers who existed. His Lordship remarked that it did not seem to be a very satisfactory way of establishing a patent, to try it in a case where the defendant did not appear, and before one who had no scientific knowledge of the matter. Mr. Moulton said the Company had commenced actions again and again, and the defendants had gone on up to the day of trial, and then disappeared. Now they had determined to demonstrate the validity of the patent in Court. Mr. D. W. Barnett, an inspector of the Company, was called, and deposed that in February last he bought three mantles from the defendant, who lived at 85, Alma Street, Hartlepool. He was a hawker, and went about selling these mantles from town to town. Witness gave the mantles to the Secretary of the Company. Mr. Horatio Ballantyne said he had examined the mantles, and found they were an infringement of the plaintiffs' patent of 1893. Professor Dewar, F.R.S., said he had given a great deal of attention to the question of incandescent gas lighting, the introduction of which was due to Dr. Welsbach, the original discoverer of the application of rare earths to lighting purposes. His invention was novel, and was not to be found in any prior specifications. His Lordship said, so far as he could judge, the patent was made out. Judgment was given for an injunction, an inquiry, and a certificate that the patent was established, and the breaches of it made out. The injunction was to restrain the defendant from infringing again during the duration of the letters patent.

The Law as to Underground Water.

In the Chancery Division of the High Court of Justice, a few days since, Mr. Justice Cozens-Hardy had before him an action brought by the owners of a mill at Lidstone, in the parish of Enstone, Oxfordshire, on a stream known as the Glyme, to restrain the District Council of Chipping Norton from unlawfully interfering with some of the sources of the water working their mill. For the purpose of augmenting the supply of water to their town, the Council laid down a line of earthenware pipes for some 120 yards, at a depth of about 14 feet, leading to a storage-tank. The pipe-line runs along the side of a hill, the geological formation of which below the top soil is a bed of broken oolitic limestone lying on a blue lias clay. The plaintiffs alleged that the effect of the defendants' operations was to diminish or entirely cut off the flow of water from certain springs that issued from the hillside below, but a few yards from, the line of pipes. They contended that the facts were such as came within the well-known legal principle that a landowner must not cut off a well-defined channel of water so as to injuriously affect a prescriptive use of it for a mill or other lawful purpose; while the defendants asserted that all they had done was to intercept a portion of the water as it percolated through the sand in which the oolitic limestone was embedded, in comparatively small lumps, and that this was what, according to all recognized authorities, they had a right to do. In support of the plaintiffs' view, Professor Boyd Dawkins spoke as to the nature of the inferior oolitic lime and the action of water upon it; and evidence was given by millers as to their observation of the diminished flow of water in the stream. On behalf of the defendants, the evidence was to the effect that no defined flow of water was cut by the work; that the springs were perennial or not according to the level of the lias clay at the point; and that water bubbled out at a varying level, and really percolated into the sand, and even at the springs did not come out in one spot as through a tap. His Lordship gave judgment for the defendants. He said the case was one in which he could rely upon the plain facts deposed to by the practical men who had given evidence as to what they actually saw from day to day in the course of their duties, rather than upon expert evidence on the nature of a geological formation. He came to the conclusion that the water did percolate and not flow through any defined channels before it issued in the springs. He must therefore dismiss the action, with costs. He would not part with the case without adding that he was not at all sure that, even if it could be made out that the water found its way through a ramification of small chinks in the stone such as one could put a knife in, it could be said to flow in such defined channels within the meaning of the cases on the subject, as to give the plaintiffs a right of action. On this point all he would say was that, as at present advised, he did not think there could be such right of action. He, however, did not decide the point.

Question as to the Foundation of a Gasholder Tank.

At the Durham Winter Assizes, a few days ago, Mr. Justice Kennedy had before him, in the Civil Court, an action brought by Messrs. R. Dempster and Sons, Limited, against the Chester-le-Street and Pelton Parish Gas Lighting Company, Limited, for the balance of an account. The plaintiffs entered into a contract with the defendants to erect a gasholder and tank. It was found that the subsoil was unstable, and this caused the tank to sink, and render necessary the deepening of the foundations The question at issue between the parties was as to who was to bear the cost of this extra work. Mr. Scott Fox, K.C., and Mr. Brook appeared for the plaintiffs; Mr. Manisty, K.C., and Mr. Lowenthal represented the defendants. Evidence having been given, Mr. Manisty submitted that, on the specification, the contract was not finished by the plaintiffs until they delivered to the defendants a tank which, when filled with water, was plumb on all sides. Then there was an absolute guarantee by the plaintiffs that they would construct a tank which would be to the entire satisfaction of the defendants. Admittedly this one was not; for, when tested, it tilted 7 inches from the vertical, and was useless. He argued that the builder, and not the employer, took the risk of any difficulties that might be encountered in the site. The builder thought his specified concrete bed would be sufficient for the tank required. He was wrong, for he miscalculated the bearing weight of the soil, and therefore must defray the extra cost of making the foundation adequate. Mr. Scott Fox contended, on the other hand, that, so far as the plaintiffs' work was concerned, it was done satisfactorily, and according to the contract and specification. The plaintiffs were not paid to advise the defendants as engineers or as to the site, and guaranteed nothing except to build a satisfactory gasholder on an 18-inch bed of concrete. Any departure from this undertaking would have been a breach of the contract, and any extension of the foundations might have meant trespass. His Lordship, in giving judgment, said the plaintiffs held that they were without liability in regard to the further work, because they fulfilled the terms of the original contract under the head "Foundations." He had come to the conclusion that their contention was not well warranted, and that the defendants were entitled to succeed. The plaintiffs guaranteed a tank which would be satisfactory and plumb, and the subsoil of the site having been found soft, there was nothing in the contract to prevent the plaintiffs from taking further precautions. He therefore gave judgment for the defendants, with costs.

Carting Gas Lime Through Streets.

Before the Southampton Borough Bench, a few days ago, Alfred Gosling, contractor, of Bishopstoke, appeared in answer to a summons taken out against him, under section 265 of the Southampton Improvement Act, in which he was charged with removing on the 17th of January, within the limits of the Act, at the hour of two o'clock in the afternoon, offensive matter—viz., gas lime—through a public thoroughfare at Southampton. Mr. C. F. Hiscock appeared for defendant. Ebenezer Slight, a carter, formerly in the employ of defendant, who had also been summoned in respect to an offence on the same day, and Police-constable Churcher repeated evidence given at a previous hearing. In cross-examination, Slight admitted tha this former statement, to the effect that he had left defendant's employ because of the smell from the gas lime, was not correct; he had been discharged. Mr. Hiscock submitted that, inasmuch as the summons against Slight was issued first, and both were in respect to the same offence, the present defendant should not be convicted, not being liable; and also that gas lime was not specified in the section. Chief Constable Berry contended that the words "or any other offensive matter" in the section covered gas lime. The Bench upheld this view, and fined Gosling 40s. and costs, but decided that the summons against Slight should be withdrawn. William Sibley, of Berry Farm, Marchwood, was summoned in respect to Silas Frumpton, a carter in his employ, who removed gas lime by his orders, in contravention of the same section, on the 9th ult. Defendant admitted the charge, but said he had not known that he could not remove the lime when he pleased. He was fined 20s. and costs—£1 6s. in all.

Serious Breach of an Electric Lighting Order.

At the Marylebone Police Court, last Saturday, the Metropolitan Electric Supply Company, Limited, were summoned before Mr. Curtis Bennett, at the instance of the Marylebone Borough Council, for having committed eight distinct breaches of the West London Lighting Order of 1889, by laying down in the district more mains than had been sanctioned and approved by the Council—viz., 44 instead of 29. Mr. Bodkin prosecuted; and Mr. Muir appeared for the Company, and pleaded guilty to six of the summonses. Mr. Bodkin explained that in May, 1900, the Company were desirous of laying a number of low-tension electric mains. They accordingly deposited a plan of the proposed works with the Council; and with one slight exception everything was agreed to. About the end of November, it was discovered that the plan was being deviated from in several respects. The trenches made were wider than they should be; the mains, instead of being laid under the footway, were carried into the roadway; and in some cases more were being put down than had been sanctioned, and they were being laid, not one on top of the other, as agreed upon, but side by side. The seriousness of this was made clear when the demand upon the space under the public streets was borne in mind. The Company, on having their attention drawn to the matter, said they proposed to occupy 3 ft. 6 in. of the roadway, owing to the great inconvenience of laying mains upon each other. But the Council refused to sanction any deviation from the plan originally submitted; and proceedings were instituted. Mr. Muir said the plan had not been deviated from in a single instance in which the public interest was concerned; and all the grievances complained of were of quite recent invention. The only offence for which the defendants were summoned was for laying five extra mains; and this was done by the Engineer under a mistaken idea of the rights of the Company, in order to supply without delay a demand for a continuous current of electricity to the premises of two of their customers. The additional space thus occupied, however, was exceedingly small; and when the Council intervened, the work was immediately stopped. The Company had only carried their works into the roadway where the trenches exceeded 2 feet. Mr. Curtis Bennett said he was of opinion that the plan submitted by the Company was most misleading, and that nothing would have been heard of the extra mains but for the discovery made by the Council. It was a bad case; and he should fine the Company the full penalty of £10, with five guineas costs, on one summons, and £5, with three guineas costs, on the remaining five—£56 in all. The other two summonses were withdrawn.

MISCELLANEOUS NEWS.

EUROPEAN GAS SUPPLY AS VIEWED BY AN AMERICAN.

One of the deputation from the American Gaslight Association to the International Gas Congress in Paris last September was Mr. F. H. Shelton, of Philadelphia; and the impressions he received on visiting some of the gas-works in England and on the Continent were given in a paper which he read before the New England Association of Gas Engineers, at the 31st annual meeting, held in Boston on the 20th ult Mr. Shelton has sent us a copy of his paper, which we reproduce, practically speaking, in its entirety.

Last summer I had the extreme good fortune to be able to spend a month in Europe. I went for relaxation, with the International Gas Congress and the Paris Exposition as objective points. I am so saturated with gas, however, that I soon found myself poking in an informal way around gas-works in foreign countries, to see "how they do things on the other side." Without pretending to here give you other than a running description of what I saw, I am yet hopeful that such account may be of interest to you, and possibly helpful, by reason of comment or suggestion. For ease of understanding, I shall refer to all quantities, figures, &c., in the United States equivalents.

I visited seven countries, travelled 3000 miles outside of the ocean voyages, and saw, successively, as below, fifteen gas-works, eleven of which were large and four small (half city and half private works), and all of which were in the main, I believe, typical and representative. My notes are, chiefly, relating to plants; the physical features being obvious to the visitor. Matters of policy, efficiency, and questions outside the works, I often could go but little into, my language abilities being limited to English, and intercourse in French, German, Danish, and Dutch being confined to the reciprocal exchange of cards, cigars, and other evidences of mutual distinguished consideration. In addition to the trip itself, I had the further good fortune to go in the company of Mr. M'Donald and Mr. Ramsdell.

The Gaslight and Coke Company.—The United States gas man upon reaching England, usually makes a bee-line for Beckton—the frontispiece plate in "King's Treatise," and all tradition putting it in mind as the biggest plant in the world, and the first thing to see. So, armed with letters of introduction to Mr. G. C. Trewby, the Engineer, and Mr. Thomas Goulden—both of whom we unfortunately missed—we went there first. To fully appreciate the plant, some figures are necessary. London has about 5 million people, and eleven Gas Companies, of which the three chief are the Gaslight and Coke Company, the South Metropolitan, and the Commercial. The others are smaller concerns around the edges. The three named, together, put out about 37,350,000,000 cubic feet per year, have about 600,000 customers, and 80,000 lamp-posts. How are those for figures? They make a 16½-candle power gas, and sell at 64, 72, and 80 c. per 1000 cubic feet. The largest is the Gaslight and Coke Company, doing 23,465,000,000 feet, or about one-sixth of all the business in Great Britain, per year, and having 360,000 customers. The Company have ten plants, of which the Beckton station is the largest. This comprises about 1000 acres—of which 600 or 700 acres are occupied—9 miles below London, on the Thames. The gas made is pumped into the city by ordinary exhausters, through two lines of 48-inch mains, at from 16 to 48 inches pressure. The output in winter of the three named Companies is over 200 million cubic feet per day, and of Beckton 50 millions. This is made in 14 retort-houses, having 8404 retorts, about half of which are charged by Foulis's and West's stoking machinery. The plant is operated by from 3500 to 5500 men, according to the season. There are nine holders, giving 19 million cubic feet storage. There is 35 million cubic feet storage outlying. The stock of coal carried is some 200,000 tons; and of oil about 2,000,000 gallons, for twelve water-gas sets that are there. The coal-hoisting machinery can discharge 2000 tons per hour from the steamers at the docks.

Entering the gates, the first impression is the avenue of nine holders of all types of the past thirty years—some with cast-iron columns, some with rounded or "whaleback" curbs, all with the sheets without breaking joints (as is the English practice), and one noble structure of 8¾ million cubic feet capacity of entirely modern type, 174 feet high and 247 feet across, in a brick tank. The very largest holder in the world—that of the South Metropolitan Company, of six 30-feet lifts, 300 feet in diameter, and holding 12 million feet—I only saw in the distance, over the roof tops. Around the Beckton premises everywhere are railroad tracks. The Company have a private system in their grounds for handling all materials, comprising 60 to 70 miles of rail, 32 locomotives, several hundred cars, and numerous full-fledged block-signal towers. The gas machinery throughout the works is so conventional as to call for no special comment. The work is done by multiplying units. The exhausters and meters are surprisingly small. Some of the latter are built in the square out-door box form of case, suggesting a mausoleum more than anything else. The purifiers are about 40 feet square, in groups of eight; the houses being of very heavy and expensive construction. The boxes are on a middle floor; and the oxide is either raised to an upper floor or dropped through into a train of cars on the ground floor, as desired. Among the miscellaneous points noted were four private sewer systems (very necessary with the army of employees), which are worked on the system of converting the waste matter into opposing sets of microbes, which destroy one another. Barracks for 3000 men adjoin the works. The boiler plants seemed insignificant and cheap. The general appearance of works, order, and condition was only tolerable. The retorts were in sets of nines. A self-sealing lid of the Holman pattern, without catch, caught our attention as very excellent. The yield of coal gas, and general operation, did not seem to differ materially from what we get here. Mr. Cossey, one of the Engineers, conducted us around; and to him we are under obligation for figures, and for the utmost courtesy.

Nairn.—It was a large drop from Beckton to our next point, a little gas-works in Nairn, away up in the north of Scotland. But our path was there, and the contrast amusing. Nairn is a delightful little residential summer-resort, quiet, sleepy town, up among the heather hills on the Firth of Forth, with the rugged hills of Cromarty in the distance. Yet in this little place of 5000 inhabitants, where the stone houses are, many of them, but one storey and with roofs thatched a foot thick, the Gas Company have 8 or 9 miles of main, 934 customers (of which 220 are slot-meters), and 300 "cookers"—as they call ranges in England—and put out nearly 10 million cubic feet yearly. The plant is picturesque, and only eighty years old. It has but one 9000 cubic feet and one 18,000 feet holder, both in the cast-iron tanks so common in England, two 9 ft. by 9 ft. purifiers, 4 and 6 inch connections around the works, no exhauster, and, I think, no boiler. Using Scotch shale, 26-candle gas is made, and sold at $1·40 for light and $1 for fuel. The chief detail noted was the use of an astonishingly small size of pipe for meter connections in some cases—a lead or composition pipe scarcely more than ¼-inch bore. This pipe was also frequently noted in Edinburgh and other places, tacked on walls—yards of it—in the weather, feeding outdoor bracket street-lamps. Why it does not freeze up or stop up, or why so small a pipe should be allowable on any meter, is beyond me. The genial Manager (Mr. Keillor) had one rather clever device—an enormous meter-index, made with dials a foot in diameter, which he uses for elucidation purposes with customers, or before an awe-inspired school class of bonnie Scotch lads. In Nairn, the practice is to collect bills only three times a year. It is a little place; but Mr. Keillor deserves a better plant to work with, for it is certainly doing its share in the 156,665,229,000 cubic feet output of the British Isles.

Inverness.—It is not very far from Nairn to Inverness; and while awaiting the boat to go through the beautiful Scotch Lakes, we visited the city gas-works for an active business centre of 25,000 people. The station impressed us as a very typical average plant; the apparatus throughout seeming to have stepped directly from the pages of the text-books and advertisements. The nine benches are semi-regenerative eights. The hydraulic was wrought iron, well above the bench. The retort-house roof was peculiar in having cast-iron rafters, but most attractive by reason of large glass skylights, letting in lots of light in front of the benches, and avoiding chilling draughts and broken glass from wall windows. The annular air condensers were out in the yard—a very common practice in the English climate. The Beale exhauster was almost identical with our M'Kenzie. The purifiers were the same as ours, except that the setting was different. They were simply imbedded in the earth, with a pavilion roof over them. Such construction cost is far less than our customary building expense; and the arrangement, if somewhat wind-sheltered, seems simple and attractive. The holders—140,000 and 375,000 cubic feet capacity—had the usual cast-iron tanks, in this case embedded in the ground. Mr. Thomson, the Engineer, reported a yearly sale of 75 million feet, 3400 customers, 400 slot-meters, 240 cookers, 26-candle power gas, and a price of 95 c. A fine chimney-stack, 101 feet high, gave draught to the benches, and was the pride of the works. They are, as they say over there, very "keen" on stacks, instead of individual chimneys for each bench, as we usually build here. The result is that in approaching an English city one quickly learns to locate the gas-works by the tall chimney, rather than by the customary gasholders, the chief features in our landscapes.

Paris.—The fourth works visited was the Clichy station, the larger of the two plants that, I believe, supply Paris. The works consist of a plain, old, large coal-gas plant, pure and simple, on first thought; surprisingly old and plain when the size of the city it supplies (2,500,000 inhabitants) is remembered. It seems, however, that the whole plant is liable to revert to the city in a few years. If this is so, it is not surprising that no money is expended on new or modern equipment. Yet, as in every works, there are several points of interest. The exhausters are of the reciprocating piston type, instead of the rotary form universally used with us. And whatever may be said against the Paris plant, the exhauster-room must be excepted. Never have I seen an engine-room in absolute quietness and smoothness of action surpassing the Paris room, in spite of six engines and exhausters, and numerous connecting, moving parts. But the purifiers! There are 128 boxes, 8 ft. by 12 ft. each, in rows and battalions, taking four houses of 32 each. This was someone's idea, once upon a time, of how to arrange things. They look like the unremoved product of a brick-making machine. The gasholders are of interest; the columns being neither round, cast, nor built-up-lattice pattern, but of plate-girder form, uncommon with us. The connections, too, instead of being underground, as with us, were of the flexible, articulated, light wrought-iron external style, connecting the crown of the holder with a stand-pipe near by—a very common form in France. The retort-houses contained benches of eights, back to back, but not through, with Siemens furnaces and wrought-iron mains. No stoking machinery is used. The tools when not in use, are hung in front of, and in line with, the retorts on overhead racks and hooks, not left in the way on the floor. The arrangement is simple and excellent.

They are very proud of an elaborate conveyor and machinery outfit at the Paris works for handling, measuring, weighing, storing, bagging, &c., coke. An illustrated paper describing it was read at the Gas Congress.* It seemed to me, though, overdone. I know that while two or three men were waiting for a *lifting* machine to slowly raise bags of coke shoulder high, so that they could get underneath them easily, a "gas-house tarrier" in the States would have had his bag half way to where it was wanted. And the men around the apparatus seemed twice as many as in our works. This may have been due to political reasons. The Paris Gas Company go in somewhat for appliances, in the city show offices; but their price of $1·70 would, seemingly, hinder fuel business. The arrangements for showing the convention through the plant were exceptionally good, a guide being provided for every twenty visitors, and a brief printed description of the plant and its figures being handed to all.

Zurich.—What a contrast, however, is the plant at Zurich. After leaving the city where the sights, the Exposition, and the Gas Congress successfully conspired against any reasonable degree of sleep, we went to this chief city in Switzerland, because everyone said it had the finest gas plant in the world, which we must see. More than glad

* See "JOURNAL," Vol. LXXVI., p. 1013.

were we that we did. The plant is a city works. Zurich lately decided upon a new plant; and two years ago this was finished. Gossip says the city paid two prices for it. Perhaps it did; but it has surely got "a plant that is a plant." It is not lavish in marble or show, but it is in space, provision for all features, for growth, and in engineering efficiency. Representing the highest type of the German school of gas engineering, it has set a new standard for such works. To describe it adequately here is impossible. To all those interested, I would say get the 28-page book, with 2 plates and 43 illustrations, describing it, just published in English, by the "JOURNAL OF GAS LIGHTING," price 60 c., *plus* postage. I can only here briefly say that in the Zurich works coal is not manipulated by hand at all. Dropped from the cars, it is first crushed to uniform size, then elevated, stored, fed to the retort-house bins, charged into, and converted to coke in, inclined retorts, withdrawn, and conveyed to the waggons, or storage-bins, all by either machinery or gravity. The retorts number 288, in four stacks of eight benches of nines each, in a house 500 feet long. The gas, steam, drain, water, and pressure pipes pass from house to house in underground conduits. The purifier-house, in use two years, looks as clean as when but two weeks from the contractor. The workmen have a house with toilet-rooms, lockers, recreation rooms, and even a hospital room, with operating table, in case of accident. An electric building houses a plant sufficient for a small town, though used only to light the gas premises. The floors are tiled. The scales on the holder-tanks are not painted, but of enamel on steel, weather-proof. An enormous central iron open shed houses all yard stuff. Not a thing is permitted to lie around, indoors or out. Characteristic of Switzerland is a four-faced clock in a stone tower, that chimes the quarter-hours. The laboratory, pump-house, blacksmith shop, ammonia plant, hot-water holder-tank heaters, and other parts, all evidence great completeness of design. Everything for a purpose, and everything figured to exact size and balance is most evident; and a tour through the plant is a liberal education in gas engineering. The city of Zurich has a population of over 100,000. The gas plant connections are of 18 and 24 inch size; and its rated daily capacity is about 2 million feet, which can be doubled in the future. Do not fail to see it, if you get within range of it.

Dresden.—With a sigh that no works in America had anything to approach those at Zurich, we proceeded to Dresden, having determined to visit representative works using inclined retorts. The works are municipal. One is first impressed by two large, ornate holder-houses of brick, much like the old style in large American cities. We were told that an old German law at one time compelled the housing of holders; it being thought that they were safer that way, confining the effects of a possible explosion. The authorities were poor gas engineers on that point. On the outside of the holder-houses we noticed dials with pointers, some 6 feet in diameter, showing the quantity of gas stored, without having to go inside the building—and, in fact, visible from all over the premises. The works, built first with horizontal retorts, four years ago put in a stack of inclines; and they were just adding its second retorts. This well shows the long life of inclined retorts. The operating figures I will give later. The ten purifiers, in a double row of five, with valve connections, were rather unusual in the symmetrical row of 30 valves down the centre aisle. The oxide arrangements were typical of what seems to be the German plan, *versus* English and American practice. We elevate our purifiers, and dump the oxide below. The Germans put the boxes on the ground-level, and remove the oxide sideways. Instead of shovelling it into shoots, they are more apt to shovel it into a hanging tip-bucket that runs on a trolley on an overhead continuous and sectional track, like a butcher's meat-rail. The buckets are pushed, with no appreciable effort, to an adjoining room, the oxide dumped, and the buckets refilled and returned around the rail-loop to whatever box is being handled. We saw this in Zurich, and at several other places. In Dresden, a large restaurant was a feature of the plant, where meals are served for a few cents to employees. It seemed strange in a works of such size to note the use of Körting steam-jet exhausters instead of the usual piston or rotary form.

Berlin.—Upon reaching Berlin, we found the capital of the German Empire supplied in part by a city works, and in part by the English Imperial Continental Company—private interests operating a number of large works in Vienna, Brussels, Antwerp, &c. We decided to make the works of the latter our visiting point, because of the probable ability to chat in English. The Chief Engineer (Mr. Drory), a veteran gas man, and one of the earliest successful users of inclined retorts, made us most welcome, ably supplemented by two of his assistants. The plant is rather old and outgrown (they are now building a new works), but in its long-continued and matter-of-fact use of inclined retorts is most interesting and convincing. We observed there many evidences of the skilled practical management of a private works, and numerous "wrinkles" in detail. For instance, on all bye-passes the stem of the inlet-valve is painted black (the metaphor of foulness upon entering apparatus), of the outlet white (significant of purity), and of the middle valve red (significant of danger, or the valve only to be handled under unusual circumstances). We noted also examples of ornamental station-meter heads that our friends across the water are rather given to; scallops and sunbursts and flowers being cast in the pattern in a way that M'Donald never does in Albany. In Dresden, the meters had Imperial lions and the Royal arms on the fronts. Large street-main float-governors of the water type were in evidence in this as in other works. Nowhere did we see a compact mercury form to compare with the Connelly, as used here.

Copenhagen.—This city of 400,000 inhabitants is supplied by two works; the old section by the city, the newer part by the Danish Gas Company—also a parent Company, running some ten works in Denmark and two in Germany. Mr. F. D. Marshall, of exceptional ability, enterprise, and personal attractiveness, and the General Manager, put us under more than ordinary obligations in courtesies extended. His works, built in seven months, in 1895 (the most practical and efficient that we visited, as regards capital outlay, and also symmetrical and sightly), are essentially of the English type in apparatus and design, excepting as to the abandonment of horizontal retorts. None of such for him. His second installation of "slopers" had been completed for about a year, and substantially enclosed in a high, white-painted, roomy, and airy building. His inclined retort setting is, for practicability, the best of all we saw, and as clean as our best water-gas houses. His design is, to my mind, even better than Zurich on one point. At the latter place, the overhead coal-charging bins, above the inclined retorts, are continuous and very expensive. They cut off much light and ventilation. Mr. Marshall makes his bin (say) but one-third the length of his stack of benches, and avoids a roof conveyor—saving in expense and gaining in cleanliness and ventilation. It is no trouble to keep it full, by vertical conveyor; and the pendant charging buckets underneath, after being filled, are readily pushed, hanging from an overhead rail, to the particular retort but a few feet away that it is desired to charge. The coal-storage bins are of trough and inverted pyramid form, constructed on the highly-commended Monier system of wire and rods embedded in cement walls.

In the Copenhagen works we saw an anti-naphthalene device which I at least have never observed in the United States. It is a "sight-feed," so regulated as to put a certain number of drops per hour of methylated spirits into the gas flowing out of the works; the idea being that during the periods of the year when naphthalene troubles are probable, impregnating the gas at the start from the works will make them least likely to materialize. The apparatus is very simple (the liquid being vaporized by a steam-coil), and is almost automatic in action. We also noticed similar arrangements for feeding benzol to the gas, to increase its candle power—a common plan of procedure on the Continent, where the coals seem to give rather lower candle powers than we are accustomed to. The most impressive feature at Copenhagen was the statement that 75 per cent. of the Company's output is sold for purposes other than light. There is a fuel-gas mark for you! Their price is 86 c. for light, 74c. for fuel, or the option of 80 c. flat by single meter. Station-meters, with the flanges *internal*, were a bit of odd construction noted.

Altona.—The works at Altona supply practically a portion of Hamburg. Here we had a good illustration of red tape and discipline. Although driving up in state, with our best manners, most engaging smiles, and pockets full of credentials, the Engineers at the works dared not let us in without the sanction of the Director-General. After a vast amount of parleying, and telephoning, and driving back and forth to the city office, we finally found that gentleman, who proved courteous to a degree, and personally showed us through the plant. Unfortunately, by that time, train arrangements gave us but twenty minutes; and the rate at which we went through the works will probably remain a record and a local tradition for many a day. However, we saw the plant; and a particularly large and commodious municipal works it is. The feature is the extensive use of hydraulic power. For instance, the box covers, about 24 ft. by 27 ft., are mounted each in the centre on a vertical hydraulic piston shaft. To raise the cover, a lever is pulled, and the lid is pushed up 8 or 10 feet, remaining in the air like a huge umbrella, while the box is being cleaned. This hydraulic power of 750 lbs. to the inch is also used to operate an elevator that raises and lowers railroad cars bodily between the works entrance high level, and the general lower yard level, in which the tracks symmetrically radiate from a central turntable. A Gadd and Mason spiral-guided columnless holder was noted. The inclined retorts there had been in use some four years.

Cassel.—The next day found us in Cassel, a German city of 100,000 population, but of no interest to the tourist excepting for a King's Palace near by. Reaching the works (also a city plant), by the most up-to-date American trolley-line that we saw, and which contrasted curiously with the narrow, picturesque German streets, we found a warm welcome by Herr Mertz, the Director. It is a typical coal-gas works, with inclined retorts. We noticed an electric plant, run by gas-engines, for lighting the works, and a briquette machine, occupying such a small space, and being so simple in its operation of turning out fuel-bricks from tar and breeze compressed, that we wondered why we do not do more of that sort of thing on this side. We also saw an excellent purifier-house, the feature of which was the centre seal in an isolated, sealed-off annex, on one side of the building. The thing that has most remained in our mind, however, was a marvellous locomotive without fire-box, with a boiler of 3 cubic metres, or about 108 cubic feet, capacity (so well insulated that it was practically cold to the hand), which gets a charge of high-pressure steam in the morning at (say) 80 or 100 lbs., and then works on that charge all day, shifting cars or standing around as the case may be, without recharging. We expressed surprise at this, and asked Herr Mertz about it again in some four different ways; but he seemingly understood the question, and stuck to it that that is what the fireless locomotive does.

Rotterdam.—From Cassel we journeyed to Rotterdam. The works (a private plant) are essentially "Early English," very conventional, and of far less interest to us than the city itself. The benches are horizontals, old and inefficient. Inclined retorts are about to go in, to replace them. The eighteen purifiers (about 24 feet square each) were reminiscent almost of Paris; and the wheelbarrow arrangement for oxide was as crude as could be. Yet curtains tacked on the boards that are laid over the cups—while filling—to keep the paint clean on the sides, was a clever thought. The most elaborate feature, and one that caught M'Donald's eye, was the pretentious meter-room. The two 12-feet Parkinson meters had most ornate case-fronts, and were mounted on heavy bases of beautifully polished red Scotch granite, which bases were surrounded by mosaic flooring and tile wainscoting. This meter-room, and the enormous Dutch windmills near by (operating by a power unassailable by gas-engines), linger in our memories, together with the courtesy of Mr. Sisson, the Assistant-Director, and his bright young Dutch assistant.

The Hague.—In Holland's capital, we visited the city gas-works, and found the chief point of interest to be the fact that, after using horizontal retorts and the best stoking machinery, and comparing such working with a stack of "slopers" alongside and under identical conditions, the management has elected for the inclines hereafter. The general plant is rather cut up, built piecemeal, and entirely conventional. In the meter-room we noticed one of the station-meters frequently seen on the Continent, wherein the usual index of a string of dials is replaced by mechanism similar to the counting-machines that we often see on pumping plants, to tally the strokes. That is, a straight row of figures in a box, that change one by one, and of which none show but the exact ones for the current meter reading. A large plan of the works, under

glass, in the exhauster room, showing all pipes, connections, valves, &c., for the guidance of the workmen, was a very practical feature.

Amsterdam.—In this city, where the plumber's signs read "Steam, water, gas, and beer piping done here," we visited the large and architecturally unusually fine plant, lately sold by the Imperial Continental Gas Association to the city, built seventeen years ago. It also is conventionally English, has no stoking machinery, no conveyors, and in but few ways is comparable with the modern plants, either English or German. A point striking us amiss was that, though surrounded by canals, the works yet provided no way to get coal by water. In common with all such plants, it has a considerable ammonia department. In addition, I saw, for the first time, the commercial saving and working up of cyanide. After the gas has been condensed, washed, and scrubbed, and before it enters the purifiers, it passes through, practically, a second rotary scrubber of the well-known standard-washer type, which, instead of being operated with water, as it would be to absorb ammonia, is operated with such a liquid as will chemically absorb the cyanide base. The resulting liquor is later treated and distilled, and the cyanide product precipitated and collected in crystals on long strings. It looks exactly like yellow "rock-candy." It is shipped broken in barrels to London for the South African gold-mining market, and brings about 15c. per lb. The process seemed fairly simple and easy for a works of a size to maintain a chemist. Amsterdam is about to contract for what was stated would be the largest holder on the Continent, some 5 million cubic feet capacity, in steel tank, and this tank is to be built hollow, and used as a storeroom—something that has been done in a few instances abroad. That is, the bottom of the steel tank, instead of being flat, is to be dome-shaped, rising almost to the water-level, yet giving around the sides the full water legs and depth. Lit by electricity inside, and with a depressed entrance, the claim is that such storage room so secured costs no more than a building would, erected elsewhere; and much ground space is saved. In all the Holland plants visited, where the streets are below sea-level, in the old sea-bed protected by dykes, the street-mains are laid on piles, to prevent indefinite settling.

Ostend.—Tiring of seeing mostly large works, I made a detour resolving to visit Ostend, a watering-place of some 30,000 to 40,000 inhabitants. I must confess that I did not see much. The plant is old, of poor design, poorly kept up, and has no features other than four benches of elevens in each arch, the largest number I have personally seen. Making from 250,000 to 500,000 cubic feet per day, they yet felt it would pay to have—and they had—a conveyor system for removing coke. A very odd bit were two steel holder-tanks in which the top rows only of plates were of cast iron.

Salisbury.—The last, and the fifteenth, works visited was back in our first love, England, in that beautiful old English town of Cathedrals and second-hand and antique shops, where they trap the unwary American dollar—and of Mr. N. H. Humphrys, who writes the English letters to the "American Gaslight Journal," and in whose courtesies I am a debtor. Salisbury is a place of 18,000 inhabitants. The gas-works, barring minor details, are practically what we find in our own country for coal-gas plants of similar size, excepting necessary differences in details and construction, and a device not seen before, by which if a workman should, inadvertently, in changing valves, shut off the town, live gas from the inlet to the holders is automatically switched into the mains. The feature that impressed me most at Salisbury, is the amount of business they do. With 18 or 19 miles of mains, they have 500 city lamps, 2000 meters, 650 cookers, and sell 100 million feet a year, or 50,000 feet per meter. The candle power is 16; the price, 84 c.; slot-meters, about 150.

The output at large in England runs two and three times ours. Salisbury is an excellent instance of it. I attribute this to several reasons: The gas companies are protected from competition by Act of Parliament. They quitted unnecessary opposition companies 25 years ago over there. We are still in that stage. Therefore, they can reach selling prices that we cannot. English companies, moreover, have been in business for 40 to 80 years, whereas our companies are but 20 to 40 years old. Hence, by this time the English companies, in business twice as long, have their towns practically completely piped, and their customers far more educated to the many uses of gas. The resulting volume of sales facilitates lowering of prices, and this in turn enables gas to be freely used in heaters as well as cookers; and the English climate is more amenable to an impression being made on it by gas-heaters than is ours. In brief, I do not believe that other than protection and long years at it are the reasons for the larger English sales. It is not cheaper coal and labour. They are not cheaper. Their operating costs seem to me less only in so far as the benefit extends to larger quantity made.

Inclined Retorts.—Let me now summarize what I saw in inclined retorts on the Continent. The universal setting was in nines. The firing generators were both internal and external. The earlier length of retort of about 12 feet has been almost uniformly changed to 15 or 16 feet as the right length—that is, in Germany, where the development is highest and a settled standard has, seemingly, been reached. The general rate of charge is five per day, or $4\frac{3}{4}$ hours per charge. The charges, in weight, run to 650 to 700 lbs. of coal. The yield per pound is about the same as in horizontals. Per $15\frac{1}{2}$-foot retort in Berlin, it was about 14,400 to 14,750 cubic feet per day, or 130,000 per bench of nines. All the fuel being taken in by conveyors, and the coke taken out mostly by machinery, the retort-house labour runs from four-fifths of a man to one man per bench of nines per shift. Drawing and recharging averaged from $2\frac{1}{2}$ to 3 minutes per retort. The carbonization generally was perfect. I can say no more—the charges were, practically universally, completely burnt off, and the coke ran out as freely as the promoters claim for it. The life of retorts is about four years, or 1500 days. We found the above facts beyond reasonable doubt. We saw inclined retorts in great numbers, in Zurich, Dresden, Berlin, Copenhagen, Hamburg, Cassel, and The Hague (seven places in four countries); and the universal verdict was the same—viz., that they were the only thing to use. Half the places were laying down, as they say, additional installations, all after comparing with horizontals, several after four years' trial of the first equipments, and one after side-by-side test with stoking machinery. Zurich, the finest plant in the world, is entirely inclines. So is the Imperial Continental's new Berlin works.

After such evidence, there is no possible doubt left in my mind as to the satisfactory working of "slopers," or as to their being the coming apparatus for works of considerable size. In this country, there is practically nothing as yet in inclined retorts. Two plants only have just been started. They will grow fast though, I believe. England is doing something in them; having numerous installations, and a strong faction advocating them and trying to agree on details. Germany has made up its mind, both as to what it wants and how to build it, and is far in advance on the question. I saw no gas-works in France, except in Paris, and conversed with but few French engineers; and can therefore give no opinion as to the status of the French on the question.

Details of Plant.—Outside of inclined retorts, and speaking entirely in a general way, there is no material difference in the best American *versus* the best foreign gas practice. Benches, stoking machinery, condensers, scrubbers, and washers are practically identical. On the Continent, however, the Pelouze and Audouin condenser is used to a much greater extent than with us. The M'Kenzie and Beale exhausters are almost identical. I saw, however, no exhauster of the two-blade Root type, although I presume they can be found. Purifiers are identical, excepting as to locations. We invariably house and usually shift oxide up and down to different levels. The English work on the two-stage plan also, in most new works, but often go out of doors. The Germans house, but shift oxide sideways, as stated. Station-meters in the main are identical, except as to ornateness. In gasholders, England leads us in size, and in the breaking away from tradition. Some 75 of the Pease wire-rope guided, and a number, I believe, of the Gadd and Mason spiral-guided columnless holders have been constructed. The six-lift 12-million feet holder already mentioned is also on plans by which the two top sections, when inflated, rise entirely clear of the framing. Distribution practice, mains, and details are almost identical. I saw no sign of high-pressure working on the lines that I have recently inaugurated; but such plan of operating was looked upon, I think, with more than passing interest, in view of its potential possibilities. Consumers' meters are of the universal type; but a very heavy proportion of wet meters is still used in England. Prepayment meters are a staple, and in use in great numbers. Labour questions trouble our English friends far more than here. The general plan is eight-hour shifts. The pay at Beckton is \$1·38, equal to \$2·07 for our twelve-hour shifts. The stokers, machinists, brickmasons, and endless other Unions, have always to be reckoned with. The superintendents generally seem to get distinctly less pay than with us. Free rent, coke, light, and taxes often, however, are included; and with cheaper cost of living in some respects, the difference may be more apparent than real. But the superintendent is frequently required to live and bring up his family at the works; and my general thought is that the superintendents in America average better pay and greater freedom. Boards of directors, who are at times a hindrance, and the cumbersome efforts of public authorities, seem to bother the earnest manager there, as much as here. While I do not rank English talent higher than that here, there are, undoubtedly, numerically many more thorough and skilled gas engineers there than here. The general average of cleanliness, fresh paint, and condition, I am sorry to say, in England appears to outrank ours.

England seems far freer from the "patent process" promoters than we are. The higher price of oil probably hinders turning out schemes so often based on a new form of oil-distilling apparatus; and the Acts of Parliament prevent the ready "opposition franchise" plan of floating new gas schemes. Legitimate water-gas plants (in which the lead is easily held by our countrymen, Humphreys and Glasgow) seem to be put in more and more every year—not to displace coal gas, but to co-operate with it, for fluctuations of output, labour questions, enriching, convenience, &c. At present, the history of the Loomis system (which you will remember was heavily installed in this country five to ten years ago, but which has almost entirely died out since) is apparently over there being repeated by the Dellwik-Fleischer, a system of blue fuel water gas, which a number of iron-working establishments have installed, and which the promoters, as usual, claim is the only way in which the regular gas companies should hereafter manufacture. Gas-engines are far more used than with us, especially in gas-works. We constantly saw them operating coke-crushers, conveyors, &c. The English gas-cookers as a rule are much heavier, plainer, and more expensive than ours. It is claimed by some that the more lasting grade pays, especially if a rental business is conducted to any extent, as is often the case. Some of their stoves are enamelled, and in colours, to prevent rusting. Readily wiped with a damp cloth, they are very attractive, and even ornamental. Gas companies abroad run on low candle powers. The South Metropolitan Company, of London, I believe, have recently been authorized to go from 16 to 14 candles. Welsbach burners are almost universal. The disappearance of the open flame is, seemingly, complete; and the use of mantle burners on the Continent, particularly for lamp-posts, is very general. Lamp-posts proper are more varied and more generally ornamental than here. The gas journals abroad are better than here. More enterprise and more technical talent is manifest in their productions than in our home papers. A part of the reason probably is a larger field justifying greater expense.

The Paris Gas Congress.—To the International Gas Congress, I shall make no special reference. An American report upon it, I believe, will shortly appear. The English "JOURNAL OF GAS LIGHTING" published an excellent *résumé* of it, which was reprinted by the "American Gaslight Journal." The Congress was much like other gas conventions, but rather larger than our principal American ones. It was seriously handicapped by the mixture of languages. A man would read a paper in one language, and a delegate afterwards would talk vigorously about it in another; while the author, wondering whether his argument was being attacked or commended, was quite unable to either grasp or answer the comments made. Distinguished presidents, secretaries, and officials were so thick as to be common; and there was a vast amount of mutual admiration and felicitation by the Honourables, of whom twenty or thirty were always on the platform, looking their most distinguished. The occasion, as a whole, was very enjoyable. The French Society were admirable hosts, and no delegate failed to appreciate, or will ever forget, the courtesies extended. The papers presented, as a rule, were of exceptional character

in reflecting the present state of the art, and will well repay systematic reading in the translations.

In conclusion, let me here again express my thanks for the continued courtesies extended throughout by many new friends met and made on the common platform of love of our profession, irrespective of the side of the Atlantic we chance to be. And to any of you who get an opportunity to visit foreign gas-works, let me say: "Do so, for every minute will be of the keenest interest."

OSSETT GAS ARBITRATION.

SURVEYORS' INSTITUTION, WESTMINSTER—Monday, March 4.

(*Before Mr.* F. PUNCHARD, of Kirby Lonsdale, *Umpire.*)

This was an arbitration to fix the price to be paid by the Ossett Corporation to the Ossett Gas Company for the compulsory acquisition of their undertaking under an Act of 1900. Mr. CORBET WOODALL was Arbitrator for the Company; Mr. JOHN MONKHOUSE, Chairman of the Gas, Water, and Electricity Committee of the Kendal Corporation, for the Corporation.

Mr. BALFOUR BROWNE, K.C., and Mr. R. P. BLENNERHASSETT, K.C., appeared for the Corporation; Mr. CLAUDE BAGGALLAY, K.C., and Mr. HONORATUS LLOYD for the Company.

Mr. BAGGALLAY, in opening, referred to the Act of last session under which the undertaking of the Company was defined as including "all the gas-works, engines, mains, pipes, machinery, lands, buildings, plant, stock-in-trade, gas coal and other stores, and all other the real and personal property, assets, and effects of whatever nature, and all the rights, powers, and privileges vested in, or belonging to, or had or enjoyed by, the Company at the date of the transfer of their undertaking to the Council under the provisions of this Act, except the books and papers relating exclusively to the shareholders in, and the members and constitution of, the Company."

Mr. BALFOUR BROWNE: That will include certain property which, but for that, would not have been included.

Mr. BAGGALLAY: Yes. Then section 5 provided for the Company selling, and the Corporation buying, the undertaking, such transfer, failing agreement, to take place under the Lands Clauses Acts—the Corporation to give notice to treat to the Company within six months of the passing of the Act, and the Company to be entitled to pay the reasonable costs and expenses incurred by them in opposing the Bill of the Corporation, and in promoting their own Bill, out of their revenue or cash in hand, and to retain one-half of the reserve fund as it existed on March 14, 1900. The section also provided for the compensation of the Manager and Secretary; for the payment by the Corporation to the Company of £225 in connection with the winding up of the Company; and for the payment of the purchase-money on an agreed day, or on the 30th of June or 30th of December after the award. Under section 6, the mortgage debt, and the interest thereon, were, after the transfer and until discharged, to be a first charge on the undertaking. Section 7 enacted that all debts, rents, charges, and sums of money, including the mortgage debt of the Company, which at the time of transfer were due or owing to or from the Company, should be paid or received by the Corporation, provided that the Company paid to the Corporation the maximum authorized dividends on the capital of the Company from the date on which dividend shall last have been paid up to the date of transfer—the dividends being treated, for the purpose of this section, as accruing from day to day. Then there was a provision for the maintenance of the works by the Company, until the transfer. The other sections of the Act were usual. Ossett was a town in the West Riding of Yorkshire, having a population of nearly 13,000; and adjoining was the urban district of Horbury, which had a population of about 7000. In 1855, an Act was obtained which incorporated the Ossett Gas Company, fixing the capital at £12,000, with borrowing powers of £3000, and incorporating the Companies Clauses Act of 1841, the Lands Clauses Act of 1845, and the Gas-Works Clauses Act of 1847. By section 13, it gave power to construct works; and by section 16, the highest charge by the Company for gas supplied by them was to be at the rate of 6s. 8d. per 1000 cubic feet for ten years, and thereafter the highest rate was to be 5s. This had never been altered, and so remained the maximum of the Company at the present day. No limit was prescribed in the Act with regard to dividend, and therefore, by the incorporation of the Gas-Works Clauses Act of 1847, 10 per cent. was the prescribed dividend; and that Act carried with it the power to make up in any year out of the reserve fund dividends below the maximum which might have been paid in previous years. In 1872, the Company, having raised all their capital, obtained from the Board of Trade a Provisional Order by which the Gas-Works Clauses Act of 1871 was declared to be applicable to the undertaking as if it had been incorporated under the Act of 1855, and the Company were authorized to raise additional capital of £28,000. If raised as ordinary shares, the dividend payable was to be limited to 7 per cent.; if as preference shares, to 6 per cent. Under that Act, also, £7000 of loan capital was raised. Further, the Order directed that the illuminating power of the gas was to be equal to 14 sperm candles; and testing was allowed. In 1897, the Company successfully introduced the system of prepayment meters, there being at present about 700 in use; and last year they began supplying cookers, of which nearly 400 were in use. During the 45 years the Company had existed, the make and sale of gas had considerably and almost continuously increased; and though in some years there had not been so rapid an increase, there was only one year when there was a decrease. The works were not only ample for performing the duties required of them, but had throughout a considerable margin, which would obviate the need for further capital expenditure for some time. They had been well maintained, and managed efficiently and economically. The mains generally were in good order, and well covered; and out of 32 miles, nearly 13 miles had been laid or relaid within the last twenty years. There had been few complaints either as regards quality or price. The gas had always been considerably above the quality required; and testing, both for illuminating power and to detect the presence of sulphuretted hydrogen, had taken place regularly every week, and sometimes oftener. The price had shown a general downward tendency throughout the history of the concern, with the exception of a very few years, when there were special circumstances. It had been as low as 2s. 6d. per 1000 cubic feet, with discounts; and although last year for a short period it was 3s., it was now 2s. 9d. with discounts. From the latter part of 1865, they had been paying the maximum authorized dividends of 10 and 7 per cent.; and by 1872 they had satisfied all claims for back-dividends. Between 1868 and 1872, the Company gradually converted the £3000 of loan capital, authorized by the Act of 1855, into 10 per cent. share capital. For some years—until the Morley arbitration—the Company, besides their maximum dividends, paid (so ample were their profits) income-tax, which should have been deducted. The authorized reserve fund was £4300; and at present it was full. In assessing the compensation, the Court had to remember that, under the Act of 1900, they had to ascertain "the price or consideration," failing agreement, by arbitration under the Lands Clauses Act. So that this was to be treated as a compulsory purchase; and under the Lands Clauses Act, compensation, which meant something over and above mere value, was to be awarded. The next question was as to what figure they were to take to be multiplied, and what was to be the multiplier. This being a maximum-dividend Company, and one which had paid maximum dividends for a long period, the true guide was the amount of the maximum dividends, because, no matter what the profit, only the maximum dividends could be paid. There was strong evidence that maximum dividends could be maintained in the fact that they had been paid for 35 years without interruption, together, for a long period, with income-tax; the reserve fund having been filled at the same time. Further, the price had been steadily reduced until it was now so low that they had nearly 100 per cent. margin by which, if necessary, to increase the revenue; and the security was so highly regarded that there were hardly any dealings in the shares—the few which had taken place indicating that the value was considered to be very high. Further evidence of security was contained in the sufficiency and condition of the works. The maximum make of gas had been about 460,000 cubic feet; and the capacity of the works was about 600,000. So that there would be no question as to capacity. The site was ample and well chosen, owing to its proximity to collieries; and it was so close to railway-sidings that some of the residuals were pumped from the works direct to the trucks on the railway. The Company also possessed ample land for extensions; the only cost of utilizing which would be the cost of obtaining parliamentary power to manufacture gas upon it. The consumption of gas had increased, although mills which used to take gas were now supplying themselves with electricity for illuminating purposes; and it was curious that since this had been taking place, the gas consumption had been greater than previously. There could be no question as to loss from the introduction of electricity, because if there had been, the Corporation would not have been keen on the purchase of the gas concern. He held that the dividends, having regard to all the circumstances, were exceptionally well secured; and if this were so, they should be capitalized on the largest number of years' purchase ever given, and 10 per cent. on that allowed for the sale being compulsory. This 10 per cent. was not merely for sentimental matters, nor for future increase; there were various other things. A man should not be required to change his investment without some *quid pro quo*. There were risks attending the operation, there was loss of income while the money lay idle, and there was the cost of re-investment, all of which had relation to the 10 per cent. The total capital of the Company consisted of £15,000 of 10 per cent. shares, and £28,000 of 7 per cent. shares; so that the amount required to pay maximum dividends was £3460. The profit on gas in 1898 was £3799; in 1899, £3728; and in 1900, £4420. So that, even after payment of the mortgage interest, there was ample to meet the maximum dividend charges. The consumption of gas had grown from 49¾ million cubic feet in 1890 to nearly 72 millions in 1900; the only year when there was a falling off being 1893. Thus the compound rate of increase was 3·85 per cent. per annum from 1890 to 1900; and from 1895 to 1900, it was 5·21 per cent. The percentage of leakage, he said in conclusion, was large; but they could not expect it to be small in a district which was largely undermined, and which was of a straggling character, and had a large mileage of mains in proportion to the number of consumers. Even if it were possible to reduce the percentage, the result would only be that, while selling the same amount of gas, they would make less; and thus the Company's profit would be larger, and the income better secured.

Mr. *Samuel Wood*, of Messrs. Lass, Wood, and Drew, put in a set of tables relating to the year ending June, 1900, giving various statistics with regard to the business of the Company.

Mr. BLENNERHASSETT said his clients had received two sets of tables—one for the year ending December, 1899, and one for the year ending June, 1900. He submitted that they should only go into those to December, 1899; being those for the last complete year before the notice to treat was given.

Discussion followed, after which the Umpire said he did not think the Court would be justified in refusing the tables put in by witness up to June 30, 1900; and they would like, in addition, the figures to the end of the year.

In cross-examination, witness said in the later set of tables the profit was £4420, and in the earlier £4117; but he did not know that this would show that there was something very abnormal and peculiar in the last six months.

Mr. BALFOUR BROWNE: Supposing there was an entirely abnormal increase in the price of residuals, that would explain it?

Witness: Yes. He added that his figures of the repairs and maintenance were derived from the books and vouchers, and partly from statements of the Secretary. Possibly they might not agree with the figures of the Accountants on the other side.

Mr. *E. H. Stevenson*, examined by Mr. HONORATUS LLOYD, said he had visited the Ossett Gas-Works twice, besides which he had a good general knowledge of the locality. The works were very suitably situated for the supply of the district, being at a low level. There was nothing between them and the railway, so that there would be no difficulty in making a siding if necessary; and they could now fill trucks on the railway from the overhead liquor-tanks by gravity. There was no doubt about the prosperity of the Company; none of the gas

companies in the area were other than prosperous. The area of land which the Company possessed was considerably in excess of present requirements. The works, too, were in excess, and some of them considerably so. The maximum day's make of gas was 460,000 cubic feet. He always took the maximum of one day, not the average of a maximum week, because the gas was made on one day; and they must have the retorts and the purifiers equal to that make. There were 112 mouthpieces, or 16 settings of sevens, all direct-fired. As at present set, they were 17 per cent. above what was required; but if they were modernized, as they ought to be, they would be 46 per cent. in excess. A maximum-price company, however, with a maximum dividend, did not care so much about increasing profit, so long as it saw its maximum dividends were safe.

Mr. HONORATUS LLOYD: A company in this position would not improve its financial value by making the alteration, however much the change might be to the advantage of the consumer?

Witness: It would in course of time; but it would not do that until the settings were worked out, and probably a bench had to come down. Then they would build in the most modern way. Where, by an alteration they could increase dividends, as with a sliding-scale company, they were much more eager to put in more modern apparatus. The condenser was equal to at least a million-and-a-half cubic feet daily; only one-fourth of it was being used, the remainder being a stand-by. The exhausters were in duplicate, very good and new, with a capacity of 840,000 cubic feet each. There was nothing much of a scrubber; it was used for tar extraction more than anything else. The ammonia was taken out by a washer, which was considerably larger than was required. There were six purifiers—four 18 ft. by 17 ft., and two 24 ft. by 12 ft.; and their aggregate capacity was 750,000 cubic feet daily. The meter capacity was 720,000 cubic feet daily. There were three telescopic gasholders—one of 450,000, one of 180,000, and one of 120,000 cubic feet capacity, or a total of 750,000 cubic feet. The works were all in excellent condition, there having been no reason to neglect them, as the Company had always had such ample means. There were also two governors.

At the present moment, the works are generally considerably in excess of requirements to meet the existing demand?—Yes.

I take it that the excess would give no additional security or value to the Company's undertaking unless as providing for future increase and future demands without further, or but little further, expenditure?—Yes; there is no further capital expenditure required, except a little for the mains, meters, and service-pipes. This affects the security of the shareholders; and everything in the history of the Company shows that the shareholders and the public thought it exceedingly well secured. An element of prosperity is the large number of prepayment meters and small cookers, which are being taken at a tremendous rate.

You are aware that during the last few years some mills have adopted electric lighting for their works?—Yes.

And not taken so much gas?—Some of them have not taken so much; some of them have taken as much as formerly.

Has this increase of which you speak occurred notwithstanding that these mills have taken to electric lighting?—Yes; and there are cases where, although the electric light has been put on, the consumption of gas has increased in the mills themselves.

Is that for lighting purposes?—I do not know. I do not trouble about that.

It may be partly for running engines to produce electric light?—I doubt that; but it may be. The general reason they take electric light is that they have a little more power on their engines than they want, and so they put up a dynamo to utilize it.

From what you have seen or ascertained as to the consumption of gas in the mills, and so on, and the loss by reason of the mills taking electricity, do you think there will be any permanent loss to the Company?—No; it has not been found to operate in that way elsewhere. The history of the place shows that it does not operate in that manner here; and I do not see any reason to expect either that the history of this Company will be changed, or that it will be different from the general run of places.

What was the first year the mills took electricity?—In 1891.

In further examination, witness said the total quantity taken by the mills last year was about 4,263,000 cubic feet; and if the whole of that were lost, it would not equal the growth of the business in that year, which was 8 per cent. as compared with 1899. The small mills were not likely to take electric light as the big ones did. The small consumers were the most profitable, and there was less risk with them. So that, with the increase of small consumers and the decrease of consumption in the mills, they were still maintaining an increased revenue; and it was better secured, inasmuch as it came from a much larger area. The prepayment consumers were charged 3s. 4d. per 1000 cubic feet when the price to the ordinary consumers was 2s. 9d.; the difference of 7d. was for the cost of meter and putting in the fittings. The works were very largely in excess of requirements; and there was considerable margin between the price the Company could charge, 5s., and the price charged, 2s. 9d. So that the Company could safely raise their price 3d. or 6d., should the cost of coal increase or anything of that sort occur. He held the security in this concern to be absolutely good; and therefore the multiplier to be applied to the maximum dividends should be high—such as would at least repay the shareholders what they were losing. The shareholders could sell shares in the open market to return them £3 8s. or £3 9s.; and therefore the concern should be capitalized on the 3¼ per cent. basis. It was usual to ask for capitalization on the 3½ per cent. basis where the company was on the sliding-scale, and where the dividend was more or less uncertain; and in such a case, when a company went out, it practically denuded the concern of everything. Here the Company left, by agreement, half the reserve fund and the balances, and an income which left a balance year in and year out; so that there were surpluses for the incoming Corporation. Therefore it must be worth more than a company with a standard price and sliding-scale. As to coal, the price was down now; and although the Company raised the price of gas last year, there was no need to have done so. They increased the price by 3d. for one half year, and had a balance of £600; whereas the 3d. on the half year only meant £440. So that, without the 3d., they would still have had £150 surplus. It showed the strong position of the Company, that they could meet the large increase of 50 per cent. on the price of coal without needing to raise the price. In the latter part of 1900, the price of coal varied from 6s. to 10s. a ton more than it was in the corresponding period of 1899. The average increase in the last half of 1900 was 4s. 5d. The 3¼ per cent. table gave 30·77 years' purchase, which, applied to the maximum dividends of £3460, equalled £106,464, or *plus* the allowance of 10 per cent.—these proceedings being taken under the Lands Clauses Act—£117,110, his final figure.

Cross-examined by Mr. BALFOUR BROWNE: No company need now look forward to any difficulty with regard to the cost of coal. In the Glastonbury case, he made a deduction because of the rise in the price of coal. With that Company, a rise in the net cost of coal meant reduced profits, because they were on a sliding-scale; and therefore the moment they had to raise the price of gas to meet the extra cost of coal, down went their dividend. It was not so with the Ossett Company. In the Glastonbury case, he said the highest number of years' purchase was 28½; but that was in connection with a sliding-scale company. The Ossett Company was a maximum-price concern. A list of cases were put to witness with a view to disturbing his number of years' purchase; but he maintained that the circumstances did not allow of comparison. It was also put to witness that a number of other companies' shares were selling to produce much more than the 3¼ per cent. on which he sought to capitalize the maximum dividends; but here again he held that the conditions of the concern did not permit of fair comparison. He agreed that in June, 1896, 10 per cent. shares of the Company realized sums which worked out to rather more than 3¼ per cent.; others to about 3½ per cent.; and an average of 233, to about 3¾ per cent. The 7 per cent. shares had sold to return about 3⅛ per cent. Witness was then taken through a number of cases in which mills had more or less ceased using gas owing to the introduction of the electric light. Practically the Company had estimated the probable loss which would arise in this way at from 70 to 80 per cent. of the quantity the mills were taking; and this they did not fear in the slightest. There was a considerable length of 2-inch main, which was due to the large number of small consumers. Many of the streets were very short, and these mains were laid along them more as service-pipes from the main roads. He did not know that the mains were in very defective condition. The percentage of unaccounted-for gas was 16·1. It ought to be down to 10 per cent. The Company said to themselves: There is a quantity of gas being sold and a profit made, and we are losing so much gas. Is it cheaper to go over these mains and put them into first-class fettle, or to lose the gas? In some places it paid to put the mains into thoroughly first-class condition; but in others it did not.

Tuesday, March 5.

Mr. *Stevenson*, in further cross-examination by Mr. BALFOUR BROWNE, said the retorts were 17 per cent. in excess, after allowing a margin. All the surplus works would give no additional security, unless as providing for further demands without further capital expenditure. If the town were on the down-grade, and there was no increase in consumption, they would only be a burden. The growth of population here had not been rapid; but this was not one of the first considerations in the supply of gas. Even in a stationary town the consumption of gas increased.

Mr. BALFOUR BROWNE: I see the report of the Company for December, 1900, states that the works are in an efficient state, and that there has been a slight decrease in the consumption of gas. Can you tell me what that was compared with the half year before?

Witness: I believe it was about 2 million cubic feet. I may say this decrease in the last half year is common to almost every place in the kingdom. The very open winter and freedom from fogs have prevented so much gas being consumed.

Re-examined by Mr. HONORATUS LLOYD: The security of a maximum-price gas company was better than that of a sliding-scale company, because the dividends were certain. In the Glastonbury case, the Company were on the sliding-scale; and the number of years' purchase—28½—was agreed on both sides, though they differed as to what was the maintainable dividend. The money asked for in the Bill which the Company promoted last year was wanted because they were going to extend their limits of supply, and to meet the ordinary growth of the Company.

The UMPIRE: You told us you fixed the number of years' purchase at 30·77?

Witness: Yes.

How did you deal with the mortgage deed?—The mortgage has to be taken over by the Corporation.

Did you make any difference in the number of years' purchase because the Corporation had to pay that off?—No; because they have value in the concern. If we had raised that on share capital, we should have been paying dividend upon it. We should then have capitalized the dividend; and the price asked would have been very much higher. As it is, the Corporation, when they come into the works, can pay off the mortgage, if the interest is higher than they like, and borrow again. It is a benefit to the Corporation to have a large proportion of the capital raised by mortgage, not a loss.

Replying further, witness said he could not state exactly what the £7000 of mortgage had been expended in, beyond works, mains, and meters. As shown by the accounts, the capital of the undertaking was £50,490; but £63,000 had been expended on the works and plant, and the £7000 was somewhere on the works.

The UMPIRE: Supposing the mortgage had not existed, what would you have done then? Would you have made any difference in the number of years' purchase?

Witness: Not if I found the Company had for forty or fifty years paid their maximum dividends, and had their reserve fund full now in case they fell upon a bad year, and were carrying forward balances, because then the income would be perfectly assured.

I thought you said the number of years' purchase depended to a certain extent upon the balances?—Yes; only to a certain extent on the average number of years. Over the series of years we have lowered the price of gas from 5s. 10d. to 3s. 9d., filled up our reserve fund, paid our maximum dividends for very nearly fifty years, and we still carry

forward a balance. There can be nothing more stable than an undertaking that can point to such a record.

Mr. CORBET WOODALL: If the £7000 had been 7 per cent. capital instead of 4 per cent. debentures, there would have been a difference of 3 per cent.; and that would represent about ¾d.

Witness: Yes; we should have raised the price of gas another 1d.

Mr. *Walter Horsnell*, examined by Mr. HONORATUS LLOYD, said he was Secretary of the Ossett Gas Company. He gave all the information he could to the accountants on both sides. He put in a table giving particulars of the consumers of gas using electric light, from which it appeared that, after installing electricity, in some cases they had taken less or ceased taking gas altogether, and in others actually consumed more than before. He also put in a list of the transfers of shares of the Company, and prices paid per share, for the three years ending June 30, 1900. This showed that the shares had sold to produce as little as, in the case of the "A" shares, £3 13s. 4d. per cent.; and, in the case of the "B" shares, £3 9s. 1d. per cent. The total number of consumers was 3194; and the number of houses in Ossett and Horbury not supplied was 1322.

Cross-examined by Mr. BALFOUR BROWNE: All these sales of shares had taken place since 1897. The agitation for the purchase of the gas-works began in 1896. Of the firms who had taken electric light, only one had increased the consumption of gas in the second half of 1900 over the first half. About 600 houses were built in the last ten years in Ossett. The rateable value of Ossett in 1890 was £40,031, and in 1899 £45,568. The population was 10,957 in 1881, 10,984 in 1891, and it was now estimated at 12,500. In Horbury, the population was 4000 in 1871, 5050 in 1881, 5673 in 1891, and at present it was estimated at 6500. The rateable value of Horbury also had increased. The Corporation paid the Company for gas £900 in 1898, £980 in 1899, and £950 in 1900. So they were the largest customers.

Mr. BALFOUR BROWNE: If to-morrow we chose to take our light by means of electricity, you would lose that customer?

Witness: There is not much fear, I think.

Replying further, witness said he did not know complaints had been made of the Company. On Feb. 19, 1894, a meeting of the representatives of all the public bodies in Horbury and Ossett was convened by the Ossett Tradesmen's Association, to protest against the price and quality of the gas. On Jan. 17, 1895, the Corporation wrote to the Company asking them to take off the 3d. per 1000 cubic feet which they had a year or two previously put on in consequence of the coal strike

Mr. BALFOUR BROWNE read the letter in reply, in which the Directors said "they will consider this matter as soon as they can see their way to do so; but they assure you that, as soon as circumstances enable them to reduce the price of gas, they will be glad to do so without being asked." Circumstances never seemed to have justified a reduction.

Mr. BAGGALLAY: The price was reduced that year from 3s. to 2s. 9d

Mr. BALFOUR BROWNE: Yes; probably at the end of the year.

Mr. BAGGALLAY: From June, 1895, I believe it was.

Mr. BALFOUR BROWNE, in further cross-examination, put a number of complaints in various forms of the Company; but witness denied knowledge of them. Counsel also read correspondence which had passed between the Company and the Corporation, with reference to the purchase, before the Bills were promoted in Parliament. He said an application was made to the Court of Quarter Sessions in January, 1899; and Mr. Beever, an Accountant, was directed to report. Mr. Beever made the overpaid income-tax for the ten years £1056, and stated: "The maximum dividends have been paid during the last ten years, although not always earned—the deficiency being obtained from the reserve fund." And further: "Probably if any fault is to be found with the Company in respect of expenditure on repairs and renewals, it is that they have not spent enough for proper maintenance of works, plant, &c.—the presumed object being to maintain maximum dividends. But this is a matter more for a gas expert than an accountant." Then he said that no portion of the reserve fund had been invested as required by the Gas-Works Clauses Act, 1847.

Witness: It is invested now.

Mr. BAGGALLAY: As you have gone into the proceedings of the Court, it is right that the conclusion should be given—viz., that they would make no order.

Mr. BALFOUR BROWNE (to witness): As at that date the reserve fund was not invested, where did you get the money to invest?

Witness: Borrowed it on loan.

How much?—£6000.

And out of the £6000 you laid away £4000 to reserve fund, and invested it in Consols?—Yes.

Out of the borrowed money?—Yes.

So that it is easy to earmark £4000 of that borrowed money, as to where it is to-day?—Yes.

And it is not a fact, as Mr. Stevenson said, that the £7000 was all expended on works and mains?—It has been, with the exception of a very small amount. It had been expended before the money was borrowed, and it has been replaced.

But the borrowed money was absolutely put into Consols?—If you put it in that way, it is so.

Re-examined by Mr. BAGGALLAY: Prior to the raising of the £6000, the Company had set money apart to form a reserve fund, but had employed it in the works. The application to Quarter Sessions was to obtain an order that, having regard to the profits the Company earned, they ought to reduce the price of gas; but no order was made. The rise in price in 1894 and 1895 was general, as a consequence of the coal strike; and at that time other neighbouring gas companies raised their price more than Ossett. If the Company lost the sale of the whole of the gas which the mills using electric light were taking, it would be more than counterbalanced by the increase in 1900 over 1899, owing to the use of prepayment meters. The Company in their Bill asked for more capital to provide the reserve fund (which they had just been advised should not be invested in the works, but separately), to deal with extensions into new areas, and for the necessary carrying on of the business in future. The sliding-scale was put in the Bill because that was generally done now.

Mr. *E. H. Stevenson*, recalled, said that he had made a structural valuation of the concern, which amounted to £63,400, although the total capital expenditure shown on the accountant's tables was only £48,000. It was well known that some companies year by year spent revenue on capital account.

Mr. CORBET WOODALL: Seeing that the consumer has to pay, in the price of gas, the dividend on the capital account, it is most undesirable that the capital account should be unduly swelled?

Witness: Yes.

Therefore it is a venal offence, even if done deliberately (which I do not say has been the case here) to put the expenditure on renewals and extensions against revenue rather than against capital?—Yes.

Do you know of cases where Parliament has allowed the capitalization of large sums of money which have been spent in this way out of profit on capital account?—Yes. Parliament generally allows about 5 per cent.

Mr. BALFOUR BROWNE said his witnesses' structural valuation did not come to £63,000; but it was more than the £48,000.

Mr. *Joseph Cash*, examined by Mr. BAGGALLAY, stated that the works of the Ossett Company were situated in about the best position as regarded pressure and distribution. They were substantial; the greater part quite modern; and, taking them all round, they were about 30 per cent. in excess. The retorts were, however, not quite equal to 30 per cent. excess, but with a little expenditure could be made so. For some years there would be no additional expenditure on works. Any additional expenditure would be for distribution—carrying gas to new consumers. The mains were equal to all demands made upon them; and, generally speaking, the concern was in excellent order. He had inquired as to the rate of increase during recent years, and as to the effect of the mills taking electric light.

Mr. BAGGALLAY: Have you formed any opinion as to whether, with that knowledge before you, the increase is likely to continue in the consumption of gas in the district?

Witness: There can be no question whatever but that the increase will be maintained. Beyond doubt, there is a large margin for the development of the prepayment meter and cooking stove business. In Brighton and Hove, there is competition with the Gas Company from the electric light, which was installed by the Corporation in 1891.

Did that affect the sales of gas of that Company?—It commenced to alter the normal rate of increase until we began to stand still. Having saturated the town with those who wished to have electric light, we resumed our sale of gas until now we have practically restored our normal rate of increase.

Do you think there is any serious development of electric lighting likely to take place in Ossett?—I cannot see any opening for it—in fact, I think it would be unsuitable for the neighbourhood.

But even if there were, you think the sales of gas would increase for fuel and other purposes, which would meet any loss on account of electric lighting?—Entirely.

Having considered the position of the Company, do you think the profit shown by them can be maintained?—I have no doubt whatever as to that; and, in my opinion, not only can it be maintained, but increased. I think it is as sure as Consols.

That being so, do you agree with the figures handed in by Mr. Stevenson, as regards the value of the undertaking?—Entirely.

Mr. BALFOUR BROWNE (in cross-examination): Speaking of electricity, do you know that there are two Power Bills being promoted in this very district this year, with a view to supplying electrical power, both for heating and lighting, at a very low rate?

Witness: I have read it. I have no personal knowledge of it.

Replying further, witness said in the Glastonbury case, he put down 6d. for repairs and maintenance, which included meters, stoves, and renewals. Here he made the figure 3·83d. It depended entirely on the position of the company. Ossett was favourably situated, being within a manufacturing district in which all the materials for repairs and maintenance were easily and cheaply obtained. The unaccounted-for gas was high; but this was an item which the Corporation would have to their advantage, as enabling them to increase the profits.

Mr. BALFOUR BROWNE: I dare say, with expenditure, we will save a lot of gas; but under the present conditions, do you not think a considerable amount would have to be spent on mains?

Witness: I should not if I were the Manager.

Further cross-examined, witness denied that £108 income from cottage property was included in the maximum dividends. There was a large surplus income above the maximum dividends which would more than cover this £108. He only allowed 28½ years' purchase in the Glastonbury case; but there there was a large claim for excess works.

Re-examined by Mr. BAGGALLAY: Glastonbury was a sliding-scale Company. The difference between a sliding-scale and a maximum-dividend company was that, with the latter, the investor was safe to receive the percentage at which he invested; whereas, with the sliding-scale company, the dividend altered as the price of gas varied. The investing public always preferred a dividend which was practically fixed—safe as Consols, as it was in this case—as against a little larger return perhaps from a sliding-scale company. He should have said the amount charged from repairs and renewals was not sufficient, if he had not seen the excellent condition of the works. The development in consumption in Brighton had been lately for warming and cooking; and he thought that there was a possibility of an increase in this direction in Ossett.

Mr. BAGGALLAY: If, as has been proved, the Company have within the last three years got some 750 prepayment meters, and within the last nine months 400 or 500 cookers, taken up, does that point to the taking by the poorer classes of gas for heating and cooking purposes?

Witness: There is no doubt about it; and it will cause the consumption to grow and extend.

Mr. *William Moys* (Manager of the Ossett Gas Company), examined by Mr. LLOYD, gave details of the extensive damage done to the mains of the Company by the workings of the collieries in the district. The 15-ton steam-roller had also caused trouble, particularly where the service-pipes went into the road. Generally, the mains of the Company were in a good state.

This closed the case for the Company; and Mr. Balfour Browne proceeded to open that for the Corporation.

(To be continued.)

WEST BROMWICH CORPORATION GAS SUPPLY.

The Allocation of Gas Profits.

At the Meeting of the West Bromwich Town Council last Wednesday—the MAYOR (Mr. J. H. Chesshire) in the chair—a recommendation of the Gas Committee that £2000 of the surplus profits of the gas undertaking for the current year should be applied in aid of the district rate for the ensuing twelve months, gave rise to considerable discussion.

Mr. WILSON, the Deputy-Chairman of the Gas Committee, moved the approval of the recommendation. In so doing, he remarked that, out of eleven members present in the Committee, seven voted for, and four against it. The great question for the Council to consider was whether the proposal was a wise one, and was warranted by the financial position of the Gas Department. As a rule, gas undertakings were judged very largely by the amount of capital employed per ton of coal carbonized. In 1896, the capital per ton at West Bromwich was £9 8s. 2d.; but since then the amount had gradually been brought down to £7 os. 3d. This was progress with which the Gas Committee had every reason to be satisfied. Although it was not so low a figure as some of the other corporations in the country could boast of, yet it was a great deal lower than in many cases. At Blackburn, it was £12 10s. 11d.; while the average of sixteen selected places, with the exception of Glasgow, was £6 14s. 2d. In reference to the financial position of the undertaking, he found that the profits last year amounted to £8327 4s. 11d., and that £3648 2s. 7d. was paid into the sinking fund. After allocating £2000 to the rates, in accordance with the principle which had always been sanctioned by the Council, the sum of £6327 4s. 11d. was received into the temporary loan and sinking fund accounts. In this way they hoped, at the expiration of 29 years, to have paid for the whole of the gas-works. Therefore, why the Council should be asked to work for posterity, he could not understand. He thought they were entitled to some of the benefits to-day; and from the policy which the Council had always adopted, and which was initiated by the late Alderman Farley, who managed the affairs of the gas undertaking with such marked ability, he should hesitate to depart. If the policy of those who were opposed to the recommendation were sanctioned, it would mean that the rates of the borough must go up to the extent of 2d. or 3d. in the pound; and he asked the Council if it would be reasonable, and judicious on their part, when they had this subject to deal with on sound financial principles, to impose additional burdens upon the taxpayers. He urged that it was the right principle to allocate this £2000 to the rates.

Mr. TURLEY seconded the motion.

Mr. BUSHELL moved, as an amendment—"That in view of the existing financial position of the gas undertaking, no contribution be made in aid of the rates until such time as the capital per 1000 cubic feet of gas sold shall be brought within safe limits; but that, in lieu thereof, the price of gas for public lighting shall not exceed that charged by the Corporation of Birmingham for the same purpose." He explained at the outset that, taken upon the present consumption, this would effect a saving to the Highway Committee account of about £850 per annum. The matter was a most serious one, and he could assure the Council that he should not have opposed the custom of granting relief to the local rates had he not thought there was sufficient reason for an alteration. Last year the Gas Committee hinted that they were afraid they would not be able to make such large contributions in the future as they had done in the past; and this was understood between them. He had gone very carefully into the matter, and he had sent a letter to each member of the Council, together with a report from the Borough Treasurer, explaining fully the position. During the discussion in Committee, not a single figure in his letter was dealt with, and the argument went on the old beaten track, notwithstanding the reasons he gave for a change of policy. They might fairly congratulate themselves upon the satisfactory and almost continuous growth in the consumption of gas; the demand being more than double that of twenty years ago. It was still increasing; so that within a year or two more plant would be necessary, involving an expenditure quite disproportionate to the immediate profit resulting therefrom. However, the gratifying fact remained that their predecessors in office, who advocated the purchase of the gas-works and carried it through, conferred a lasting benefit upon the town; and although they might easily have been in a stronger financial position than they at present were, it only needed a few years' economy of profits to make up the leeway, and put the concern upon such a basis that it would bear comparison with any other. Mr. Wilson's interesting statement with regard to the capitalization of various other corporations did not affect the question. The position of affairs was shortly this: Their debt cost them 2½d. per 1000 cubic feet more than Birmingham, or (say) over 2s. 1d. per ton upon the coal carbonized, amounting for the year ending the 31st of March last to no less than £3080 os. 7d.; and if the situation was to be saved, he thought they would agree with the imperative need for an alteration in their policy, otherwise they would hand over to their successors an intolerable burden. They had not in the past properly provided for depreciation; during the last twenty years only £4000 had been put to this fund. They resorted to loans without making proper provision out of the revenue. It was true they had been reducing the capital account; but he considered they had been much too slow about it. He called attention to the great benefit the borough derived from the gas-works in the shape of rates. The amount for the past financial year was £1678 6s. 8d., or 1-34th of the total rates paid; while during the twenty years these were £24,157 10s. 5d. A great part of this large sum could not have accrued if Birmingham had continued to supply the district. But coal gas no longer held undisputed possession of the field; and with the present competition, their capital account was vastly heavier than it should be. He asked the Council to consider whether they were justified in handing money over to the rates until this was brought within safe limits. One interesting feature of the matter was that during the twenty years the sum of £25,500 had been handed over in relief of the local rates. If this amount had been applied instead in liquidation of the gas-works debt, the Gas Committee would have saved the undertaking £9600 in interest. This was an appalling figure; and he pointed out that of the present £2000 some £700 would go into the pockets of small consumers and those who did not burn gas.

Mr. BROCKHOUSE seconded the amendment, and urged that the policy in the past had not been a sound one. Here was an undertaking with £40,000 goodwill, and £4000 set aside in twenty years for depreciation. Some time back the Local Government Board refused to sanction a loan for £10,800 for the remodelling of the plant, and the replacing of that which was worn out; and now they were doing their best to find this out of revenue. It would not be wise to state the exact position of affairs in connection with the gas undertaking; but it was something alarming, and if the authorities knew it, they would come down upon them.

Alderman PITT (Chairman of the Gas Committee) expressed regret that Mr. Bushell had made an attack upon the policy of his Committee. He said they were selling gas as cheaply as Birmingham, and even 6d. per 1000 feet less for power. He argued that the bulk of the gas loans under the present system would be paid off in 29 years from the present date. No one had spoken more highly of the good results produced in the past than Mr. Hudson (the Borough Treasurer); but now he condemned the system. What was the meaning of this change of front? He urged that, as the ratepayers had to find the money for the various improvements, they were entitled to any little advantage from the gas undertaking. They would have to increase the rates 2d. in the pound; and if the amendment was carried it would mean another 2d.

Mr. BUSHELL, in reply to a question, said he was quite willing that the amendment should not affect the £2000 allocated this year.

Alderman SALTER said if Mr. Bushell was willing to go so far, he would suggest that the whole matter be referred to the General Purposes Committee.

Alderman BLADES supported the amendment, on the ground of the unfairness of the recommendation that gas consumers should relieve the rates for the benefit of those who did not burn any gas. It appeared to be necessary to change their policy; and he thought they should be careful in future in allocating profits to the rates when the concern would not justify it.

After some further remarks, the amendment was carried by the casting vote of the Mayor; but it was arranged that the decision should not affect this year's rate.

BUDE GAS SUPPLY.

Opposition to the Stratton and Bude Gas Bill.

A keen controversy has arisen at Bude and Stratton, in North Cornwall, respecting a proposal to supply the towns with gas. About two years ago, the Local Authorities asked Messrs. Willey and Co., of Exeter, to prepare a report as to the cost of erecting gas-works and lighting the town. The report was presented; but the Council took no action upon it, and have of late been talking of the possibility of utilizing a local water supply for the purpose of generating electricity for the lighting of the town. Under these circumstances, Messrs. Willey and Co. decided to take steps themselves for providing light, and, as notified in our "Parliamentary Intelligence," a Bill is being promoted for the purpose of incorporating and conferring powers on a Company to be called the Stratton and Bude Gas Company. The District Council have asked for the insertion of clauses giving them the option of purchase, within ten years, at the net cost of the undertaking. This condition Messrs. Willey and Co. declined to grant; and last Wednesday the Council met and decided to oppose the Bill. On the same evening a meeting of the owners and ratepayers was held to confirm this action. Mr. J. Treleaven, the Chairman of the Council, presided. Mr. H. A. Willey attended, and explained the position of affairs and the principal provisions of the Bill. The purchase conditions asked for by the Parliamentary Agents of the Council were, he said, absurd; but, if approached with any reasonable proposal, he should be delighted to consider it. In answer to a question, he said that, though he would be willing to part with the undertaking at a fair value, this could not be put in the Bill because it would be impossible to raise capital under such conditions. If they could come to terms, such as the Council were claiming, respecting the price, pressure, &c., it would avoid waste of money. Mr. Gurney said that Mr. Willey's Parliamentary Agents had replied to the Council's overtures that they must "take the Bill as it is," and that they were prepared to fight it. In answer to other questions, Mr. Willey said it was not intended to charge for the gas 6s. per 1000 cubic feet (the maximum named in the Bill), but the price would be regulated to return such a profit as Parliament would allow. The Chairman said the Council were of opinion that the Bill was not fair to the district. The ratepayers were told that they would be able to purchase at a reasonable price; but when the Bill was examined, there was nothing of the kind there, while the promoters had refused to entertain any of the proposals which had been made to them. He moved a resolution authorizing opposition to the Bill; and it was carried with one dissentient.

Carburetted Water Gas for Leeds.—At the meeting of the Leeds City Council last Wednesday, a resolution, proposed by Alderman Lowden, was unanimously passed, accepting the tender of the Economical Gas Apparatus Construction Company, Limited, for an installation of carburetted water-gas plant at the Meadow Lane station, and defraying the cost out of the reserve fund. The amount of the tender was £6295.

The Disturbance of Public Streets.—In order to avoid constant and unnecessary disturbance of the streets, the Nottingham City Council have adopted a proposal of the General Purposes Committee that before any main or cable work is carried out, the Committee proposing to undertake it are first to report to the Town Clerk, and the report is then to be sent to the various other Committees. By this means, the whole of the information will be brought to one centre, and all work required to be done can then be executed at the same time. Of course, this will not apply to service connections.

MELBOURNE METROPOLITAN GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on the 26th of January, at the Company's Offices in Melbourne—the Hon. J. C. HAM in the chair.

The SECRETARY (Mr. J. Hinde) read the notice convening the meeting, and also the Directors' report. The latter set forth that the amount standing at the credit of the net revenue account was £67,386; and, after deducting £20,000 carried to the reserve fund, a dividend of 4s. per share was recommended. This would amount to £34,288, and leave a balance of £13,098 to be carried forward. The accounts accompanying the report showed that the revenue for the year was £167,633 (£137,597 being for gas and £30,028 for residuals), and the expenditure £98,198; leaving a balance of £79,435 to be carried to the net revenue account. According to the statements relating to the working, there were carbonized, under the supervision of the Company's Engineer (Mr. R. O. Thompson), 60,560 tons of coal, and 619,300,000 cubic feet of gas were made, together with 30,965 tons of coke and 610,140 gallons of tar; the make of sulphate of ammonia being 615 tons. Of the total production of gas, 552,236,000 cubic feet were sold, and 564,622,000 cubic feet accounted for. For the public and contract lighting (5766 lamps), 35,395,000 cubic feet were used.

The CHAIRMAN, in moving the adoption of the report, said it would be satisfactory to the shareholders to find, from the accounts accompanying it, that the amount received for gas sold represented an increase of about 5 per cent. on the half year ending Dec. 31, 1899. The returns from residual products were also highly satisfactory. There had been an exceptional demand for coal in Newcastle; and the Company, along with many other public and private bodies, received notice of the suspension of their coal contract. It was well known that many of these bodies suffered severely on account of the increased price they had to pay for coal; but he was glad to say the policy adopted by the Board—and it was one which he felt sure would be fully approved of by shareholders—of keeping a very large and ample stock, had placed them in such a position that the Company did not lose a shilling, the Directors being quite independent during the suspension. In consequence of the gradual completion of the sewerage operations in the city and suburbs, the Company's loss from leakage was much less than it had been. The alteration in the system of gas manufacture from horizontal to inclined retorts was being proceeded with at the works, and would doubtless result in a great saving to the Company. The cost of the alteration would come out of the reserve fund. It would be noticed that the Directors had transferred £20,000 to this fund, deeming it, as they did, absolutely necessary in a concern of such magnitude to make provision for any contingency that might arise. It was the opinion of the Board that the reserves should be still further strengthened in the future. As a consequence of the building operations going on in all the immediate suburbs of Melbourne, new consumers were being obtained from time to time; and no doubt the Company would largely share in the prosperity dawning upon the State. Nothing had been, and nothing would be, wanting on the part of the Directors to bring the works up to the latest ideas in gas manufacture.

Mr. T. LUXTON, in seconding the motion, congratulated the Board and the shareholders alike on the very successful half year just closed. As a shareholder, he considered the Directors had acted very wisely in building up a large reserve fund, which would enable them in the future to maintain the present rate of dividends. He called attention to the small amount (£478 14s. 2d.) written off for bad and doubtful debts, which he thought reflected the greatest credit upon the Directors and officers.

Mr. J. ROBERTSON said he was not altogether satisfied with the balance-sheet. Although the action of the Directors might be a good one, he did not think they were justified in passing to the reserve so large a sum as £35,000 in one year. Having regard to the increase in the business during the past six months, as compared with the corresponding period of 1899, he thought the holders who had paid high prices for their shares should participate in the increased profits.

The CHAIRMAN explained that the amount to be carried to the reserve fund was to meet the expenditure for altering the retorts. All the money required was not being provided last half year, but a portion had previously been set aside. He thought it would be very imprudent to increase the dividend ½ per cent. now, and have to reduce it next time. He trusted that, when the Directors could see their way to declaring a higher dividend, they would be able to maintain it. The Board were anxious that there should be an increase in the dividend at the proper time.

The motion was carried, and the dividend recommended declared.

The retiring Directors and Auditor were re-elected, and the proceedings closed.

GAS, WATER, AND GENERAL INVESTMENT TRUST.

The Thirteenth Ordinary General Meeting of this Company was held last Tuesday, at Winchester House, E.C. The report submitted by the Directors stated that the revenue for the year ended Jan. 28, after providing for interest on debenture stock and all expenses, and transferring a sum of £2000 to a special reserve fund, amounted to £23,821, to which had to be added the balance of £4649 brought forward from last year, giving a total of £28,470. Out of this sum, interim dividends were paid in August last, for the half year ended July 28, at the rate of 4½ per cent. per annum on the preferred stock, and 2 per cent. per annum on the deferred stock. For the second half year, the Directors recommended a similar dividend on the preferred stock, and one at the rate of 4 per cent. on the deferred stock. This would leave a balance of £7681 to be carried forward. During the year, the Directors had realized a considerable number of non-dividend paying securities; and the loss occasioned by these sales had, after deduction of profits made on sales during the year, been debited to the suspense account for the adjustment of securities. A sum of £22,960 written off the cost of several of the securities had also been debited to this account. As a result of these several operations, the valuation of securities at Jan. 28 last showed an improvement of about £52,000, compared with the previous year. The number of securities held was 215; and these stood in the books at cost price, less the amount of £62,340 written off out of realized profits or placed to suspense account. There had been considerable improvement in the amount of securities producing revenue; but some were still in default, and remained much depreciated in value. In the opinion of the Directors, further provision will therefore ultimately have to be made.

The Chairman (Mr. J. B. Braithwaite) said he thought they were to be congratulated on the steady progress that was being made towards bringing the Company into a sounder position than had hitherto been enjoyed. Last year they were able to give the deferred shareholders an additional ½ per cent., and to increase the carry-forward by about £1800; while this year they gave the deferred stock 1 per cent. more, and increased the carry-forward by £3000. In addition to this, they had been able to place £2000 to a special reserve fund. It would be seen, therefore, that the actual result of the year was that they had earned £5568 more than in the previous twelve months. Under these circumstances, they had felt justified in resuming the payment of interim dividends on the deferred stock. There was nothing of special interest in the balance-sheet on the present occasion. The total reduction of their liabilities amounted to about £35,000; and the number of securities now held was 215, as against 241 last year. With reference to the present position as to depreciation, the shareholders might be interested to know that, so far as it was possible to judge, the unquoted securities they held were worth about £18,000 more than the amount they stood at in the books, and the quoted securities £107,000 less. The latter figure, however, had been considerably modified since the end of January. Putting the two together, a further depreciation of £90,000, in round figures, was shown; but against this, they had securities held on revenue account which stood at £50,000. He thought the Company were now within sight of the end of their depreciation. Considering the uphill fight they had had during the past few years, this was a very decided step in the right direction; and probably in another year or two, if they continued to progress as they were doing, the securities would be worth the sum at which they stood in the books. As to the investment of the Company in Salt Lake City, the business of the Utah Light and Power Company showed a marked improvement; and this also applied to the Kenilworth Sugar Estates. The report was adopted.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 3, Lothbury, E.C.—Sir JOHN AIRD, Bart., M.P., in the chair.

The SECRETARY (Mr. W. B. Peat) having read the notice convening the meeting,

The CHAIRMAN said the Board greatly regretted to have to announce the death of one of their most respected members—Mr. Thomas Fenn. Though advanced in years, his services had been very valuable, especially having regard to his early connection with the Company. They had that day elected in his place Mr. Burney. With regard to the year's working, he thought that, taking it all in all, this had been satisfactory. Financially the result did not come out quite so well, in consequence of the increased price of coal which they had had to face during the past year. They were not like the London Gas Companies, who could take advantage of the sliding-scale to increase the price of gas; they had to pay more for coal, and still had to supply gas at the same rate. Had it not been for this question of coal, the Directors would have had the pleasure of placing at the shareholders' disposal the small additional bonus which they had for so many years distributed. For the moment, they thought it better not to add to the Company's obligations, but to keep everything in order, and to sacrifice the bonus for the time being. The results of the working during the year under review had, he was glad to say, been satisfactory. They still kept on the best of terms with the Syndic, the Prefect, and the other authorities, although they had little differences of opinion sometimes, and occasionally small law-suits. The Syndic had a desire to meet the Company in the fairest possible spirit; and there was no doubt that, while this condition of affairs existed, the prosperity of the business would be enhanced. With regard to the water supply, it had been a remarkable year. Generally there was no rain between May and November, but there had been rain throughout the past twelve months; and while this had proved beneficial to the crops and industries of Sardinia, it had not been without its advantages in giving the Company an unlimited supply of water. The increase in water receipts during the year had amounted to £184; while those from gas were £210 more. In addition to this, the expenditure on the waterworks had been £877 less; the figure being £1038, as against £1915. They had had during the year certain expenditure in connection with mains, services, and meters—some £500; and the capital account being closed, this had been debited to revenue. Rates and taxes and general charges remained about the same, as did also exchange on remittances and the London Office expenses. Mr. Simmelkjör, in a very able report which he had prepared, said that without calculating on any increase in receipts, next year's accounts ought to show an increase of profit of at least £1000. This was the first time in 34 years that they had had to pay £424 for damage caused by a burst water-main; and it ought to be the last. Coal had already commenced to come down, and freights also. The Company's coal bill would be at least £500 less than last year's; and the total expenditure ought to be £1000 less than in 1900, and the profit £1000 more.

Sir FREDERICK WIGAN, Bart., seconded the motion.

Mr. PAYNE, referring to the sinking fund and the reserve fund, said that some years ago he made inquiry, and found that the whole of these funds was invested in one security. He thought this was a mistake—particularly in the case of the sinking fund, on which they would have to rely for the return of their capital on the expiration of the concession. Another point was the investment of a portion of the reserve in the Pirri works. The item of £1666 17s. 5d. with reference to these

works appeared on both sides of the account. He should be glad to know under what circumstances a part of the reserve was invested in this way, how the money was secured, and whether it was secured to the satisfaction of the Directors.

The CHAIRMAN said the amount standing to the credit of the sinking fund and the reserve fund was now invested in various securities. He asked Mr. Simmelkjör to reply to the other point raised.

Mr. S. SIMMELKJÖR said that Pirri was a small village about 1½ miles outside Cagliari. It was more than twelve years since the water-works were constructed. Of course, the villagers had no money, and so the Company had to find it. Up to the year 1899 the money stood in the books at Cagliari, but did not appear in the London books, because there was a contract with the villagers that they would (if they could) pay it off by yearly instalments. But they had not found it convenient to do so, and they were under no obligation in the matter. The same thing had happened in the case of another village called Pauli; and the contract was modified in such a way that the Company became proprietors of the works. The Commune paid interest on the capital. The interest on the amount of £2523 was put to the credit of the reserve fund. This was the explanation of the sums appearing in the London accounts. The security was, of course, ample, because the pipes and everything belonged to the Company.

On the motion of the CHAIRMAN, seconded by Sir F. WIGAN, a dividend was declared at the rate of 8 per cent. per annum (less income-tax) for the half year ended Dec. 31, making 7 per cent. for the year.

The retiring Directors (Messrs. S. Simmelkjör and W. R. Galbraith) and Auditors (Messrs. H. Bishop and R. S. Robb) having been re-elected,

Mr. PAYNE moved, and Mr. OLDAKER seconded, a vote of thanks to the Chairman and Directors and officials of the Company for their very careful management of the business. This was unanimously carried.

The CHAIRMAN, in acknowledging the compliment, said the Company were very fortunate in their officers. Mr. Peat, in London, did everything possible for the business; and Mr. Sanna and Mr. Webster, in Cagliari, were devoted to the interests of the Company.

The meeting then closed.

HARROW AND STANMORE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday last week at the Albion Tavern, Aldersgate Street, E.C.—Mr. CHARLES HORSLEY, J.P., presiding.

The ENGINEER and SECRETARY (Mr. J. L. Chapman) read the notice convening the meeting; and the report and accounts were then submitted.

The CHAIRMAN, in moving their adoption, remarked that although, of course, the question of coal cropped up once again, it had not made so much difference to them as to some other companies; for the gas consumption was growing well at Harrow. They had raised the price of gas 3d. per 1000 cubic feet, towards meeting the extra expenditure; but, of course, in the near future they hoped to take this off again. There was one remark in the report to which he must call their attention. The Directors much regretted to have to inform the proprietors that, in consequence of advancing years, Mr. James Glaisher had resigned the chairmanship of the Company, a position which he had held since its formation. He was very sorry to lose his friend Mr. Glaisher, because he and Mr. Glaisher went on the Board at the same time. However, he trusted that Mr. Glaisher would continue to enjoy as good health as he could wish. The gas-rental in the six months under review was £8357, or an increase of £998 over the corresponding period of the previous year. The increased sale of gas in Harrow had amounted to 735,000 cubic feet, or 4 per cent.; in Sudbury and Harrow Weald, to 411,000 feet, or 9·39 per cent.; and in Stanmore, to 878,000 feet, or 12·11 per cent. The gas consumed for public lighting had increased by 580,000 cubic feet, or 14·79 per cent. This gave a total increase of 2,604,000 cubic feet, or 7·67 per cent., which was an improvement all round. Meter, stove, and fittings rental showed an increase of £47, or 12·77 per cent. He called that very satisfactory; and if they could only go on in this way, their prosperity would be greater than it had been in the past. The receipts from coke (£1173) showed an increase of £230; from tar (£249), of £7; and from sulphate (£187), of £14. Of course, the price of coke had risen in sympathy with that of coal. The receipts for the half year were £10,416; being an increase of £1329 over the corresponding period. Of this, £400 was due to the rise of 3d. per 1000 cubic feet in the price of their gas; but even allowing for this, they were still £900 to the good. The expenditure had been £7456, or an increase of £1258. Coal and oil had cost more by £1027, wages had risen £75, repairs to mains were £114 more, lamplighters' wages had increased by £40, rates and taxes by £32, and management expenses by £14. On the other hand, repairs to works had cost £81 less. The profit for the six months was £2960, or an increase of £71 over the same period of the previous year. To pay the dividend and interest on loan required £2954, so that there was a balance surplus on the half year of £5 to carry to the previous balance, which now amounted to £1242. The quantity of coal gas made was 31,199,000 feet, and of oil gas 9,822,000 feet, or a total of 41,021,000 cubic feet. There had been 36,516,000 cubic feet of gas sold, 518,000 feet used on the works, and 3,937,000 feet unaccounted for. The percentage of loss for the six months was therefore slightly more than 9½ per cent., but over the whole year it was only 7½ per cent. Coin meter supplies were steadily progressing; and cooking-stoves also were in demand. He thought these figures showed that they had done very well indeed. They proved that the use of gas was rapidly increasing. Electricity had not put their light out yet; and it would not do so. Now that they were going ahead, they would keep ahead.

Mr. A. H. BAYNES seconded the motion, which was carried.

On the proposition of the CHAIRMAN, seconded by Dr. J. W. LEE GLAISHER, dividends for the half year were declared at the rate of 8 per cent. per annum on the original "A" capital, of 7 per cent. on the additional "B" capital, of £5 12s. per cent. on the additional "C" capital, and of 6 per cent. on the guaranteed shares—all less income-tax.

The retiring Director (Mr. A. H. Baynes) and Auditor (Mr. James Randall) having been re-elected,

The CHAIRMAN proposed a vote of thanks to the Engineer and Secretary. They had been passing through an anxious period; sometimes they had run short of coal, and at others the coal was bad. But beggars could not be choosers; and they had had to take what they could get. However, he hoped these times had gone by, and that Mr. Chapman would now have some peace and comfort. But considering the very satisfactory increase in the consumption of gas, he did not think Mr. Chapman ought to feel too much worried. No more fuel than was absolutely necessary was used in the retort-house; and the make of gas was very good indeed.

The motion was seconded by Mr. BAYNES, and carried.

Mr. CHAPMAN, in returning thanks, said he was very much obliged for the renewed vote of confidence. It had been a time of difficulty for all men connected with gas supply undertakings, on account of the advanced price of the materials from which they made the consumers' useful light; and they had all been afraid lest they might not be able to pay their usual dividends. In fact, a great many companies had had to reduce their dividends. He felt that all those connected with their Company had cause for thankfulness, for they had actually earned £71 more profit than they did in the latter half of 1899. He should use his best endeavours to as quickly as possible reduce the price of gas to the figure it formerly stood at—if not lower; and to enable as good dividends to be declared—or even more.

A vote of thanks having been accorded to the Auditors,

Mr. A. F. PHILLIPS proposed that a similar compliment be paid to the Chairman and Directors. They all realized that they would not have had so good a balance-sheet if the Board had not made very favourable contracts for coal; and having obtained the coal, they also secured good results from it. It was the combination of these circumstances, together with the increase in the sale of gas, that had given the good results now placed before them.

Mr. FREDERICK LENNARD seconded the proposition, which was heartily agreed to.

The CHAIRMAN briefly acknowledged the vote.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The annual meeting of the Canterbury Gas and Water Company was held on Monday last week, when the Chairman (Mr. D. Amos) stated that the price of coal during the past year had risen upwards of 58 per cent., which meant an extra cost of £3500 for the past six months, to meet which they had been compelled to raise the charge for gas by 6d. per 1000 cubic feet. The Directors were glad, however, to report a continued increase in the demand. They had made nearly 4½ million cubic feet more gas than in the preceding year, although they had carbonized 50 tons of coal less. This result was due to the re-arrangement of the retorts during the past six months. As regarded residuals, there had been a good market for coke at enhanced prices. They had used in manufacture 43 chaldrons of coke less than in 1899, and this was due to the adoption of one of Wilton's furnaces, by which they only consumed breeze, instead of a large proportion of best coke. As regarded sulphate of ammonia, they had made 30 tons more, although carbonizing 50 tons less coal. This was due to an alteration in the scrubbing plant, whereby the whole of the ammonia was taken out of the gas. He thought it only just to state that these results had been brought about by various alterations suggested by their Engineer (Mr. H. C. Page), all of which they believed would tend to increase the balance of profit in their revenue account; and to him their thanks were due. It was also very satisfactory to the Directors, inasmuch as it confirmed the opinion formed of Mr. Page's capabilities when they selected him as an up-to-date Manager. The demand for gas for cooking and heating continued. During the year they had fixed a very large number of slot meters, and now had 1617 of these meters and 901 cookers in use. The plant, both gas and water, was all in good repair and working order. The report was adopted, and a dividend of 4¼ per cent. for the half year, making 8½ per cent. per annum, was declared.

At the annual meeting of the Chelmsford Gas Company, the Directors reported a balance of £2825 available for distribution; and dividends of 9 per cent. on the original, and £6 6s. per cent. on the additional capital, free of income-tax, were recommended. They announced that, in consequence of the continual increase in the quantity of gas sold (last year amounting to more than 8 per cent.), it would be necessary shortly to increase the storage capacity at the works by enlarging one of the existing holders. The Chairman (Mr. W. W. Duffield), in moving the adoption of the report, said they had passed through the year without doing what some gas companies had been compelled to do—raise the price of gas for the purpose of meeting the increased cost of coal; and he hoped they would be able to offer a still further reduction to the consumers. Another pleasing feature was a decrease of the leakage. With regard to the question of public lighting, they all knew the competition the Company were subjected to by electric lighting at Chelmsford. Although he was compelled to be somewhat diffident in his remarks on this question, seeing that he was a member of a public body which had under its charge the public lighting of the town, he thought he was not out of place when he said the Company had nothing to be ashamed of in what they had undertaken in the way of public lighting. He thought he should not offend the most sensitive persons interested in electric lighting, when he said that the incandescent gas system was as good as—perhaps he ought not to say superior to—any public lighting he had seen in a country district like theirs. He believed that public lighting by gas was less expensive than electric lighting. With regard to the proposed enlargement of one of the gasholders, the Engineer (Mr. E. W. Smith) said the general rule of gas companies was to have storage capacity equal to 1½ days' consumption, whereas theirs was equal to only half this. The report was adopted, and the dividends recommended were declared.

At the recent half-yearly general meeting of the Cleethorpes Gas Company, the accounts presented showed that the revenue in the six months ending Dec. 31 last amounted to £7986; and the expenditure, to £4666—leaving £3320 to go to the profit and loss account. The balance available for distribution was £4454; and the Directors recommended the payment of dividends at the rate of 11 per cent. per annum on the original shares, and of £7 14s. per cent. per annum on the new shares, free of income-tax. This would leave a balance of £3055 to be carried forward. These dividends averaged £8 3s. 6d. per cent. per annum on the whole of the nominal share capital. In moving the adoption of the report, the Chairman (Mr. J. Robinson) said the profits were higher, and the working generally better, than in any previous period in the history of the Company. The increased output of gas had been quite without precedent, being upwards of 23 per cent. more than in the corresponding six months of the preceding year. The high contract for coals—the highest for the last 26 years—and the all-round increase in the cost of materials generally, had caused the Directors some anxiety as to what their effect would be; but he was very pleased to be able to state that, despite these adverse circumstances, the profits had been greater than ever before. This they might attribute to a very large extent to the skill and energy which the Engineer and Secretary (Mr. E. J. Brockway) had brought to bear in connection with the undertaking. The high price of materials had been an incentive to him to work even more economically, with the result that they had made and sold more gas per ton of coal carbonized than previously, and used a smaller percentage of coke for fuel, the proportion for sale having consequently correspondingly increased. They had fixed 307 new meters (chiefly prepayment) for consumers, and placed 335 cooking-stoves on hire. It was very gratifying to be able, under all the circumstances, to recommend the payment of higher dividends by 1 per cent. per annum on the original shares and 14s. per cent. on the new shares; and also at the same time to announce a reduction of 3d. per 1000 cubic feet in the price of gas to the ordinary consumers. They were thus sharing the benefits of the successful working between the shareholders and the consumers. The report was adopted. At the close of the business, those present were invited by Mr. Brockway to partake of light refreshment, to celebrate their first meeting in the new Board-room. Before separating, the proprietors made an inspection of the works, and much satisfaction was expressed with the up-to-date character of the plant, and the general orderly appearance of the place. It may be added, as showing the progress of the Company, that in the ten years ending Dec. 31, 1900, the quantity of gas sold increased from 17,606,000 to 61,845,600 cubic feet.

The report and statement of accounts presented at the annual meeting of the Cradley Heath Gas Company showed that the profit amounted to £2997, which, with the balance brought forward, made a total of £3804 available for distribution. The sales of gas showed an increase of 9¼ million cubic feet compared with the previous year. During the twelve months, alterations and additions had been effected at the works, including the erection of new stores and further retorts. The Chairman (Sir Benjamin Hingley, Bart.) moved the adoption of the report, and congratulated the shareholders upon the satisfactory working of the concern. Dividends at the rates of 10, 7, and 4 per cent. per annum were declared upon the different classes of shares.

A remarkable state of things was revealed at the recent half-yearly meeting of the East Ardsley Gas Company. Mr. A. F. Goodson, one of the Directors (who presided), explained that there was no dividend—in fact, it was a wonder there was a Company at all. The Directors had stood between life and death, as during the last two years they had lost half their district, owing to the Morley Corporation having obtained powers to supply gas to West Ardsley. Their profit was only £3 4s., besides having expended £216 4s. on necessary repairs. The leakage was 40 per cent. After some discussion, the accounts presented were passed; and it was decided to raise £700 more capital.

In the report presented by the Directors of the Hastings and St. Leonards Gas Company at the half-yearly meeting last Thursday, they stated that the great feature of the six months covered by it—viz., July to December—was the enormous increase in the cost of coal, amounting to £6981 more than for the corresponding period of 1899. This extra expenditure was not equalized by the advance of 4d. per 1000 cubic feet in the price of gas, and the higher returns from coke and tar; the profit balance being £1833 less than it was for the corresponding period of 1899. The accounts accompanying the report showed that the sale of gas produced £35,589; residuals yielded £9954; and the total receipts were £48,029. As the expenditure amounted to £38,183, there was a balance of £9846 to go to the profit and loss account. The Directors recommended the payment of dividends at the rates of 6 per cent. per annum on the converted 5 per cent. stock, and of 4½ per cent. per annum on the converted 3½ per cent. stock, both less income-tax. The portions of the accounts relating to the manufacturing operations of the Company showed that, under the supervision of the Engineer and Manager (Mr. Charles E. Botley, M.Inst.C.E.), 16,901 tons of Newcastle coal, 57 tons of cannel, and 121,063 gallons of oil were employed in the past half year in the production of 219,003,000 cubic feet of gas, of which 47,682,000 cubic feet were made from oil. The estimated quantities of residual products were: Coke, 10,558 tons; breeze, 823 tons; tar, 172,991 gallons; and ammoniacal liquor, 297,842 gallons.

At the half-yearly meeting of the Horley District Gas Company next Thursday, the Directors will report that during the six months ending Dec. 31 last there was a highly satisfactory development of the business; the sale of gas having increased upwards of 26 per cent. as compared with the second half of 1899. The revenue was £1984, and the expenditure £1344; leaving a balance of £640. A dividend at the rate of 5 per cent. per annum (less income-tax) will be recommended; leaving £117 to be carried forward.

The report presented at the annual meeting of the Ilfracombe Gas Company last Wednesday showed an available balance of £2251, from which the Directors recommended the declaration of the statutory dividend of 5 per cent. on the preference stock and of 5 per cent. on the consolidated ordinary stock. The increased make of gas for the year was 2,357,800 cubic feet. The price of gas would be reduced by 2d. per 1000 cubic feet from the March quarter; and the Directors expressed the hope that they would be able to make a further reduction during the year, should the coal tenders for the coming twelve months be let at a favourable rate. The Directors had submitted a scheme to the District Council for carrying out the electric lighting of the town; but the Council could not give any definite answer. The report was adopted.

The annual general meeting of the Londonderry Gas Company was held on the 1st inst.—Mr. W. Tillie presiding. In moving the adoption of the report, the Chairman expressed his pleasure in recording another prosperous year's trading. The total output of gas was now upwards of 90 million cubic feet; the increase during the past twelve months having been nearly 5 per cent. In view of the fact that they were still menaced by electric lighting, it should be their aim to keep the price of gas as low as possible, and as soon as practicable bring down the present figure. They should also turn their attention to the extension of the consumption of gas for cooking purposes. He did not think this had taken hold in Derry as it ought to have done, considering the low charge for gas and the high price of coal. Another subject he might refer to was penny-in-the-slot meters; the number in use being 128. This, to his mind, was much less than it should be, considering the high price of oil. But he thought when the people understood better this mode of gas supply they would deem it to be to their interest to adopt it more extensively. They had every reason to be satisfied with the present position of the Company. The report was adopted; and a dividend of 11 per cent., free of income-tax, was declared. A vote of thanks having been accorded to the Chairman, Directors, and officials, it was acknowledged by Mr. Tillie and the Secretary (Mr. Macnie); the latter stating that the report just adopted was the thirty-fifth he had submitted to the shareholders since he came to Londonderry. He referred to the many changes which had occurred in the interval, and alluded to the progress and prosperity of the Company being a reflex of the extension of the city in its industries and building.

At the recent annual meeting of the Longwood Gas Company, the accounts presented showed that the total revenue amounted to £11,877, and the expenditure to £8875; leaving a balance of £3002 to go to the profit and loss account. The amount available for distribution was £5172; and the Directors recommended dividends of 5 per cent. on the original shares, and of 3½ per cent. on the new ordinary shares—making with the interim dividends paid for the June half year 7½ and 5¼ per cent. respectively. According to the report, the quantity of gas sold during the year was 59,217,800 cubic feet—an increase of 1,581,700 cubic feet, or 2·75 per cent. The number of cookers fixed on hire at the end of the year was 305—an increase of 96; and the number of meters fixed had then risen from 3664 to 3779. At the request of the Chairman (Mr. E. Armitage, J. P.), Mr. J. H. Brearley, the Company's Manager and Secretary, gave some statistics in reference to the past year's working. He said that from the point of view of the gas industry last year had been the most critical one since 1873, to which year they had to go back for a parallel in coal prices. Competition from the public supply of electric current was experienced for the first time in the Longwood district; but, notwithstanding this, and the general depression in trade, the consumption of gas showed a slight increase upon 1899. The prepayment meters numbered at the end of the year 830, and from them £1155 had been collected. The Chairman, in moving the adoption of the report and accounts, remarked that, considering the abnormal price of coal and other circumstances, the results presented were most satisfactory. The stock of coal at the end of the year was 600 tons more than it was at the corresponding period of 1899, and on the advice of the Manager they had increased the capacity of their stores so as to be better prepared for emergencies. They had decided to erect plant for the manufacture of sulphate of ammonia; and he believed it would prove an additional source of revenue. He quoted figures which showed how the leakage had been reduced since 1886, when it was 24 per cent., to 1899, when it was only 7½ per cent. Last year, however, there was a slight increase to 9 per cent., owing to several breakages of mains caused by sewerage operations. He added that the Directors were perfectly satisfied with the manner in which Mr. Brearley had conducted the business during the year. Every credit was due to him for it; and they hoped he would remain with them for many years. The Vice-Chairman (Mr. R. Thornton) seconded the motion, and spoke very highly of the condition of the works. Mr. J. B. Knowles, a Director of the Gomersal Gas Company, cordially endorsed these remarks, and expressed his pleasure at noting that although in 90 per cent. of the gas undertakings of the United Kingdom the price had been advanced, this had not been done in the case of the Longwood Company. The report was adopted, and the dividends recommended were declared.

The half-yearly meeting of the Normanton Gas Company was held on the 16th ult.—Mr. E. Mitchell presiding. The Chairman, in moving the adoption of the report, pointed out that the half year covered by it had been a trying one both for gas and railway companies, owing to the increased cost of coal and other materials, which caused a reduction in profits of £159. The extra expenditure on coal alone amounted to £793. Another cause which militated against the profits was the cost incurred in stopping leakages, 10 broken mains and 53 drawn joints having to be dealt with. These matters having been adjusted, a recurrence of expenditure therewith was not anticipated. The account at the bank being overdrawn to the extent of £989, it would be necessary to consider the advisability of issuing the balance of the additional stock, amounting to £3000. The profits were £1044, and the sum available for distribution was £2944; and dividends of 5½ and 4 per cent. on the original and additional stocks were recommended. The motion was unanimously carried.

The accounts presented at the meeting of the Riddings District Gas Company last Friday week showed that in the six months ending Dec. 31 the revenue was £2547, and the expenditure £1518; leaving a balance of £1029. The sum available for distribution was £2932; and the Directors recommended a dividend at the rate of 7 per cent. per annum, free of income-tax.

At the recent annual general meeting of the Rushden and Higham Ferrers District Gas Company, the report presented by the Directors set forth that the profits amounted to £3549; and they recommended dividends which, with those paid in October, made 10 and 7 per cent. for the year on the two classes of stock. They gave the shareholders

the gratifying information that all branches of the business had developed of late; the most rapid increase being in connection with cookers and prepayment meters. The gas made during the past twelve months was 73 million cubic feet, against 62 millions the previous year. The Directors expressed the opinion that the Company were deeply indebted to their Engineer and Manager (Mr. T. Watson), for the great zeal he had displayed in promoting their interests, and the courteous manner in which he had always carried out his duties. The report was adopted; and the dividends recommended were declared. The following figures bear out the Directors' reference to the development of the Company's business under Mr. Watson's management. In the year ending Dec. 31, 1897, the make of gas was 37,887,200 cubic feet, whereas last year it was 73,548,800 cubic feet. The number of cookers has risen from 68 to 1016, and of slot meters (of which about 92 per cent. are in connection with cookers) from 162 to 1229. In 1898 the practice of providing cottages with fittings (all on slot meters) free was commenced, and 89 were supplied, rising to 151 in 1899, and to 353 last year. Four years ago the consumption by cookers was 1,406,000 cubic feet; in 1898, it was 5,225,600 cubic feet; in 1899, more than double—10,620,500 cubic feet; and last year it was 16,144,100 cubic feet. The revenue from slot meters has increased from £257 in 1897 to £2705 in 1900. These figures show that an essentially working-class population appreciate the value of gas when facilities for obtaining a supply are put in their way.

Considering all the adverse influences of the past half year, the Sevenoaks Gas Company made an excellent showing in the report presented at the recent meeting of shareholders. The gross receipts amounted to £9103, against £7321 in the corresponding period of 1899, and the expenditure to £6921, compared with £5344—producing a profit of £2182. The balance available for distribution was £5001; and dividends at the rates of 10 and 7 per cent. were recommended. The Chairman (Mr. W. H. Cronk) showed how the business had increased in the past few years by quoting the following figures as to the output of gas: In 1897 it was 61,345,760 cubic feet; in 1898, 64,344,050 cubic feet; in 1899, 65,866,860 cubic feet; and in 1900, 72,376,200 cubic feet, or an increase on the year of 6,509,360 cubic feet. The report was adopted. During the meeting, great regret was expressed at the death of Mr. John Read, who had performed the duties of Auditor for twenty-four years.

At the annual meeting of the Shotley Bridge and Consett District Gas Company last Friday, the report for the past year showed that the total revenue was £13,174, and the expenditure £10,727. The balance remaining for distribution was £2027, and a dividend of 4 per cent. per annum was declared.

At the recent half-yearly general meeting of the Sutton (Surrey) Gas Company, the Directors reported an increase of 1,936,000 cubic feet, or 3·27 per cent., in the consumption of gas in the latter half of the past year, notwithstanding the mildness of the early winter. There was a net increase of £2545 in the revenue account. It had been decided to build a new retort-house, which, when in full working order, would have a productive capacity of a million cubic feet per diem. The necessary plans had been prepared by the Engineer. The Chairman (Mr. F. Budgen), in moving the adoption of the report, said the capital expenditure during the half year amounted to £3432; and it had been largely employed upon a new main to Banstead and in the erection of new condensing, washing, and scrubbing plant, a new mess-room for their men, &c. The capital had been overspent to the extent of £5536, and necessitated the raising of additional capital. The business was progressing, and the Directors were able to come before the shareholders and recommend the payment of the full dividend. Looking at the exceptional increase in the price of coal, they might consider this a very satisfactory position. Slot meters were becoming a very important item in their accounts; and since the commencement of the business in this particular direction, they had received £1446 16s. 8d. from that source. The report was adopted. Votes of thanks having been accorded to the Chairman, Directors, Secretary and Engineer (Mr. G. Mead Robins), and Manager (Mr. S. Carpenter), the ordinary business closed. A special meeting was then held at which authority was given for the raising of additional capital.

Presiding at the annual meeting of the shareholders of the Tunbridge Wells Gas Company, the Mayor (Mr. W. H. Delves), in the course of his address, made a feeling allusion to the loss sustained by the Company by the death of the late Secretary and Manager, Mr. John Read. He also remarked that the Directors had passed through a very anxious year, owing to the enormous cost of coal. The late Secretary and the Engineer were consulted as to the possibility of paying the dividend without increasing the price of gas; and the decision to allow the price to remain had been abundantly justified. The amount paid for coal had increased by £8000, of which £6500 was due to the increased cost, and the remainder to the extra consumption. The officials had exercised the greatest economy and care, and the expenditure, apart from the coal, had only increased by £25. This was most satisfactory, considering that the extra quantity of gas manufactured was 10 million feet. The receipts from gas-rental had increased from £31,390 to £33,389. The total receipts had advanced by £5700; and to show the extent of the Company's business, he might state that the year's income was £51,400, which compared very favourably with the figures of previous years. The Directors hoped, with economy and increase of business, to be able to pay the full dividend this year without dipping, to any large extent, into the balance brought forward. The report and accounts having been adopted, a sum of £4965 was set apart for the payment of the usual dividends.

In moving the adoption of the report and accounts (see p. 631) at the meeting of the Tynemouth Gas Company last Thursday, the Chairman (Mr. J. B. Williamson) referred to the advance in the price of coal. Fortunately, he said, the Company had in the early part of the year a most favourable contract running, which did not finish until July; but when the Directors were obliged to go into the market, they found they had to pay so much more for their coals that the cost in the second half of the year alone would be from £6000 to £7000 more than would have been paid at the old price. However, they had to pay the high price, but they only contracted for a supply that would serve to the end of March, instead of June or July, as they would have done if prices had been more favourable. Last September another difficult problem presented itself. That was a demand from the whole of the men at the works for an advance in wages of 12 per cent. Sunderland and South Shields were asked for a similar advance; and the result was that a federated Board, with representatives from the three Companies, was formed to deal with the question. A basis was finally agreed upon, whereby the men received advances of from 4 to 5 per cent., according to the class of work they did. There was also an understanding that no change in the rate of wages would be demanded for two years. The increase granted would mean an additional expenditure in the Company's wages bill for the year of about £600. As a result of these difficulties, the Directors were obliged to face an advance in the price of gas; but it was not until the last quarter of the year that anything was done. At that time, however, they increased the price 4d. per 1000 cubic feet, bringing it up to 2s. 7d. in the borough. Notwithstanding this, the Directors quite expected a deficit at the end of the year; but, fortunately, coke came to the rescue. Prices went steadily up, with a strong demand both for local consumption and for shipment; the result being that coke alone gave them £11,726 on the year, or £4936 more than in the previous year. The amount received for gas was £34,304, as against £29,396 in 1899. The gross revenue from all sources in the past year was £52,312, as against £41,757 in the previous year. The net profit was not so large last year; being only £6843, as against £9289 in 1899. However, after paying interest on debentures and providing for the maximum year's dividend of 5 per cent., amounting to £6221, the Directors proposed to add £500 to the reserve fund, which would then stand at £8000, and also add £121 to the balance carried forward from last year, which would then amount to £4166. During the year, 1286 slot meters were fixed—an increase of 144½ per cent. on the previous year. Upwards of 5½ tons of copper had been collected from these meters, representing £2716. Alluding to the future of the Company, the Chairman said their contract for coals terminated at the end of the present month; and he was pleased to say that they made a contract a fortnight ago with one of the leading Durham collieries for 35,000 tons of their best gas coal, which was the estimated quantity required to carry them on for twelve months. The new coal would cost 6s. 6½d. per ton less than the present rate; and the difference in price on the year's requirements between the old and the new contracts amounted to £11,411. The shareholders were to be asked for authority to raise £30,000 of additional capital, in such sums as might be deemed advisable by the Directors. This was necessary by reason of the continued increase in the demand for gas, and would principally be used to pay for the new retort-house and fittings and the high-level railway siding, which went to form the first part of the scheme for duplicating the present works. The house, when fully completed, would have a manufacturing capacity of 2½ million cubic feet of gas per day. The report was adopted, and the dividend declared. The Directors were also authorized (at an extraordinary meeting) to raise the additional capital mentioned.

In addition to the particulars furnished in the annual report of the Walker and Wallsend Gas Company, noticed in the "JOURNAL" for the 19th ult., the Chairman (Mr. T. Crawford) gave a few interesting statistics at the ordinary meeting of shareholders. He said they had had a very good year; and, had it not been for the high price of coals, the result would have been more advantageous to all concerned—both to the shareholders and to the consumers. They had paid for coals 133 per cent. more than in 1896. The residuals had produced £8428, as against £4955, which compensated for the high price of coals. The coal carbonized had been 10½ per cent. more than in the previous year, and the average price per ton was 55½ per cent. more. The gas made had been 11 per cent. more than last year, and the gas sold was 10·17 per cent. more. For the coke sold, they had received nearly 20 per cent. more than in 1899. The tar made had increased by 5·70 per cent., and it realized 54¾ per cent. more than before. The gas sold to large consumers had increased by 5¼ per cent., and to ordinary consumers by 13 per cent.; and the gas supplied through prepayment meters had gone up by 38 per cent., and that used in gas-engines by 14¼ per cent. During the year, they had written off £1260 for old works which had been renewed; so that at present the works at Walker and Willington Quay, especially the latter, were comparatively new. In 1867, when the works were started, they made only 18 million cubic feet of gas; and now they made upwards of 203 millions. Of ordinary consumers they had 1626 in 1899; while last year they had 1803—an increase of 10·88 per cent. Of automatic meters there were 457 in 1899; and last year 656—an increase of 43·54 per cent. After the report had been adopted, the Chairman mentioned that the electrical department had made a fair start, and they were supplying several works. The works were for the supply of both electric lighting and power, but principally power. The machinery and equipment had been of a most satisfactory character. He congratulated their Engineer on the admirable way in which he had performed his duties. Mr. Walker, the Gas Manager, had taken charge of the distributing arrangements, and there was a Committee formed between the Company and the Newcastle Company to attend to the generating station. Everything was going on most satisfactorily.

The annual general meeting of the Wellington (Salop) Gas Company was recently held at the Offices—Mr. Harry Shepard presiding. The Chairman gave an interesting and exhaustive account of the past year's working; showing that, notwithstanding the great increase in the price of coal, the business had been of a satisfactory and encouraging character. He referred to the larger number of prepayment meters in use, and to the increase in the consumption of gas for power. The new telescopic gasholder was complete, and was expected to be shortly in use. The new retorts and machinery (under the supervision of Mr. Herman Taplay) had effected great economy in the production of gas. The report was unanimously adopted; and dividends at the rate of 10 per cent. on the original, and 5 per cent. on the new shares were declared.

Water Companies.

With a net balance at the credit of the past half-year's profit and loss account of £1572, the shareholders of the Sevenoaks Water Company have declared dividends at the rate of 9 per cent. per annum on the consolidated stock, and £6 6s. per cent. per annum on the share capital. A balance of £328 remains to be carried forward.

The 37th ordinary general meeting of the Woking Water and Gas

Company was held at the Company's offices, Great Winchester Street, E.C., last Tuesday—Mr. Charles Horsley in the chair. In moving the adoption of the report, the Chairman referred to the new works which were authorized by the Act of 1899, and empowered the Company to take a supply of water from the Thames at Laleham Burway, Chertsey. The works had been commenced, and would be carried to completion with all possible expedition. With regard to finances, the capital expenditure in the past six months had been £10,700. The revenue was £4847, against £4418 for the half year ending June 30 last; being an increase of £429, or nearly 10 per cent. He thought this was very satisfactory. The profits amounted to £2818. Adding the balance brought forward and deducting interest on debentures and income-tax, there remained a sum of £2629. It was proposed to pay a dividend at the rate of 4½ per cent. per annum, which would absorb £2037, and leave £592 to be carried forward. The quantity of water pumped during the half year was nearly 78 million gallons, as compared with 66½ millions in the previous six months. Mr. R. Hesketh Jones seconded the motion. Mr. C. E. Jones congratulated the Board on their management of the undertaking. The report was adopted, and the dividend declared.

THE SUFFOCATION BY GAS IN BETHNAL GREEN.

A Pure Accident.

At the Bethnal Green Coroner's Court last Wednesday, Dr. WYNN WESTCOTT resumed the inquiry into the circumstances attending the deaths from gas poisoning of Louisa Jane Sharp and two of her children at 28, Culham Buildings, Bethnal Green, on the Boundary Street Estate of the London County Council, as already recorded (*ante*, p. 640). It may be remembered that on the previous occasion allegations were made that officials of the London County Council had been informed that there was an escape of gas, and that nothing had been done with regard thereto. The inquiry was therefore adjourned to allow of the investigation of this matter.

Mr. ANDREWS appeared for the London County Council; Mr. G. H. YOUNG for the Commercial Gas Company; and Mr. BASSETT HOPKINS represented the relatives of the deceased.

The first witness called was

George Dixon, a porter in the service of the London County Council. He said his duties included sweeping the gardens, lighting the staircases, &c., on the estate. He also cleared the gas-meters, adjusted them, and attended to complaints about everything. He was continually seeing Mrs. Sharp, and had never noticed her the worse for drink. She never complained to him of an escape of gas. He cleared the money from her meter on the 7th of January. He had adjusted all the meters, including this one, before that date. There were from 1500 to 1600 automatic meters on the estate, and he attended to all of them.

By Mr. YOUNG: The fittings were all the property of the Council, and the Gas Company had nothing to do with them.

By Mr. HOPKINS: On his last round for adjusting meters, he altered the one in Mrs. Sharp's room from 25 to 22 cubic feet for 1d. It was one of Glover's meters, and their men had shown him how to do it. He was a gas-fitter, though he had never been apprenticed.

Dr. *Heartt Oliver*, recalled, said, in answer to Mr. HOPKINS, he was sure death was due to gas poisoning. He had not examined the gas to see whether or not it was a mixture of water and coal gas.

Mary Harris deposed to visiting Mrs. Sharp about a fortnight before her death. She had to leave because the smell of gas made her feel sick, and Mrs. Sharp said she had spoken about it to the man who collected the rent.

Mr. *Grimwood*, senior official in the gas-testing department of the London County Council, said he had many years' experience in connection with this work. He examined the meter in question, and found a slight escape, but not sufficient to do any harm. The examination lasted two hours, and was made five days after the deaths.

By Mr. HOPKINS: Water gas was heavier than coal gas, but not heavier than air.

Mr. *Edward Leonard*, a building inspector to the London County Council, said there were 1054 tenants on the estate, and roughly 5000 persons. The Council had just under 1000 meters of their own, and the Gas Company supplied them in one block. The meter in question was not the Company's, and was the one produced.

Mr. *Christopher Walker*, the Resident Superintendent on the estate, said no complaint had been received at the office.

Witness's "clerical assistant" corroborated this statement, and other evidence of a similar nature was given.

Mr. *H. Leicester Greville*, F.I.C., F.C.S., Analyst to the Commercial Gas Company, deposed that the Company supplied the London County Council, and not the tenants.

Mr. ANDREWS (interposing) said the Council were supplied by the Company, and they in turn supplied the tenants. They were supposed to make a profit; but, as a matter of fact, there was a loss.

Witness said the gas the Company supplied was a mixture of coal and oil gas. He made a test after this case occurred, and found the gas supplied consisted of 21½ per cent. of oil gas and the rest coal gas. They were required to give an illuminating power equal to 16 candles; but as ordinary coal gas only had from 14 to 15 candle power, oil gas was used to make it up. It was produced from coke, water, and petroleum oil. The odour from oil gas was as powerful as that from coal gas. Oil gas was used at Birmingham, Manchester, Liverpool, Brighton, Croydon, and by several large corporations.

By Mr. HOPKINS: His Company supplied a compound of oil and coal gas. Witness proceeded to explain the process of manufacture.

The CORONER (interposing) said they were going into scientific questions which were beyond the scope of the inquiry, which was to ascertain the cause of death, and whether anyone had been guilty of such conduct as to justify him being committed for trial.

Mr. HOPKINS remarked that two large bodies were interested.

The CORONER acknowledged that they were two important bodies—one a Company, and the other the London County Council, who always tried to do their duty, especially with regard to the housing of the poor. There was no suspicion of foul play, and the Jury had to find whether there was any criminal blame attached to anyone. It seemed to him that there was an entire absence of even any suspicious circumstances. There was no evidence that Sharp had tampered with the meter to get out of it more gas than he paid for. It seemed that the meter was, like all mechanical appliances, liable to go wrong. It did go wrong, and these poor unfortunate people died in consequence.

The Jury found that death was due to accidental suffocation by gas through a defective meter and insufficient ventilation.

The CORONER said there was no evidence as to ventilation.

The Jury thereupon withdrew their finding on this point.

INSPECTION OF GAS AND METERS IN MASSACHUSETTS.

Eudiometric Tests of Gas.

We have received the annual report of the Inspector of Gas and Meters in Massachu setts (Mr. Charles D. Jenkin). It shows that in the past year 725 gas inspections were made, 30,565 meters tested, and a number of eudiometric gas analyses carried out, in addition to the ordinary office work. Owing to the increased quantity of gas supplied by the 69 companies in the State, the number of inspections increased from 687 in 1899 to 725. The gas of every company was tested at least twice during the year; and an additional inspection was made for every 6 million cubic feet of gas supplied by each company. No company's gas was however, tested more frequently than once a week. The average illuminating power of the coal gas supplied by 37 companies was 18·18 candles, as compared with 18·25 candles in 1899; of the water gas, supplied by 12 companies, 22·85 candles, against 23·88 candles; of the gas sent out by the 13 companies supplying mixed coal and water gas, 20·14 candles, against 20·02 candles; and of the petroleum oil gas supplied by 7 companies, 39·48 candles, against 40·97 candles. There were 49 violations of the law last year—6 being in respect of deficient illuminating power, 21 in regard to an excess of sulphur, 8 to an excess of ammonia, and in 14 the gas contained sulphuretted hydrogen. On the 27th of December the gas of the Amesbury Company was found to be free from sulphuretted hydrogen for the first time since Nov. 3, 1893. While the excesses of total sulphur increased from 17 in 1899 to 24 in 1900, the reduction of the sulphuretted hydrogen excesses from 24 in 1899 to 14 in 1900 indicates that more care is being exercised in purification. Mr. Jenkins remarks that sulphuretted hydrogen is exceedingly poisonous; and he says there is no excuse for leaving any of it in the gas, except carelessness or broken or insufficient apparatus, as it is easily detected and as easily removed. On the other hand, the determination of the amount of total sulphur is a delicate chemical operation, requiring skill and apparatus not generally possessed by gas-works managers. In the absence of means of knowing how much sulphur is left in the gas, it is difficult to know how to change the purification.

At the request of the Board of Gas and Electric Light Commissioners, a test was made of the gas furnished by the Massachusetts Pipe-Line Gas Company to the Brookline Gaslight Company at their Allston station, and also that furnished to the Jamaica Plain Gaslight Company. Immediately after the Allston test, one was made of the gas furnished to their consumers by the Brookline Company from their holders. These tests comprised the usual illuminating power, sulphur, and ammonia tests, the specific gravity, eudiometric analysis, and heat units by the calorimeter. The analyses are first and eighth in the table of analyses; the other results are as follows:—

	Massachusetts Pipe-Line Company.	Brookline Gas Company.		Massachusetts Pipe-Line Company.	Brookline Gas Company.
Candle power.	21·1 ..	21·4	Specific gravity	0·437 ..	0·532
Sulphur grains	11·5 ..	10·1	B.T.U. gross .	677·200 ..	688·200
Ammonia ,,	1·0 ..	1·0	B.T.U. net .	624·600 ..	645·000

The Jamaica Plain Company's works were visited, and the manufacturing plant was found dismantled; only the exhauster, station meter, and holder being in use. Here a sample (No. 9) was taken of the Pipe-Line Company's gas as it entered the works; and immediately after a regular examination was made, at the office, of the gas as supplied to the consumers, the illuminating power being 19·1, the sulphur 14·3. The analysis is No. 5 in the list. The last 13 analyses were made at the request of the Board of Gas and Electric Light Commissioners.

Table of Eudiometric Analyses.

Company.	Candle Power.	Specific Gravity.	Illuminants.	B. T. U. Gross Calculated.
Brookline	21·4	0·532	9·52	688·2*
Danvers	15·0	..	4·54	..
Fall River	15·1	..	8·40	..
Haverhill	23·7	..	11·51	..
Jamaica Plain . .	19·1	..	5·97	664·1
Lynn	18·5	..	7·52	..
Malden	14·7	..	10·74	..
Massachusetts Pipe-Line Company, Allston . . .	21·1	0·437	8·53	677·2*
Do., Jamaica Plain .	..	..	6·34	626·1
Stoneham	13·7	..	5·76	..
Wakefield	18·3	..	5·97	..
Boston	23·7	..	15·17	705·3
,, ...	23·2	..	15·49	684·5
,, ...	24·2	..	11·45	670·7
,, ...	21·6	..	7·49	654·6
,, ...	23·1	..	8·93	676·7
,, ...	21·3	..	8·57	681·9
,, ...	20·8	..	9·04	687·4
Brookline	19·3	..	6·38	652·2
,, ...	22·6	..	14·79	645·9
,, ...	21·0	..	6·53	679·2
,, ...	20·0	..	5·78	642·4
,, ...	19·8	..	5·35	676·2
,, ...	20·8	..	7·72	704·8

* Experimentally determined by calorimeter.

With regard to gas-meters, as already stated, 30,565 were inspected last year. Of this number 29,928 were new or had been repaired, and were presented for examination before being used again. There were 637 meters which were suspected of registering inaccurately, and were tested again. The result was that one meter would not pass gas, and therefore could not register; while three would pass it, but would not register. The average error of the rest was 0·74 per cent. fast. Of the total number of meters re-inspected, 258, or 40·5 per cent., were fast, the average error being 4·81 per cent.; 77, or 12·09 per cent., were slow, the average error being 10·75 per cent.; and 298, or 46·78 per cent., were correct. Of the fast meters, 145 registered between 2 and 5 per cent. fast, 103 between 5 and 10 per cent., 6 between 10 and 15 per cent., 3 between 15 and 20 per cent., and one was just 20 per cent. fast. Of the slow meters, 32 were between 2 and 5 per cent. slow, 29 between 5 and 10 per cent., 7 between 10 and 15 per cent., 4 between 15 and 20 per cent.. and 1 each 26, 30, 53, 105, and 174 per cent. slow. If a meter registers 1 foot of gas while passing 3 feet, the gas passed without being registered (2 feet) must be 200 per cent. of the amount registered (1 foot); the meter would then be 200 per cent. slow. Mr. Jenkins points out that meters should be set in easily accessible places, and not more than 6 feet from the floor. This would, he says, allow the consumer to frequently read his meter, and, in case of an accident, such as a broken pipe or fitting, to quickly turn off the gas.

ELECTRIC LIGHTING NOTES.

The Local Government Board have sanctioned the borrowing by the Mexborough District Council of £18,000 for an electric lighting installation.

Last Wednesday, at a meeting of the Middlesbrough Electric Lighting Committee, the Clerk was instructed to apply to the Local Government Board for sanction to borrow £21,000 for additional generating plant and extensions of cables.

The Electrical Engineer submitted to the Stockton Town Council, last Tuesday, an estimate, amounting to £21,000, for the additional machinery required, and the necessary cables, in connection with the proposed extension of the electric lighting system in the town. He was instructed to prepare the necessary plans.

In connection with the new town, called Vickerstown, on Walney Island, Barrow, which is being built by Messrs. Vickers, Sons, and Maxim, and where upwards of 1000 houses are being erected for the workmen employed at the shipyard, an application has been made to light the whole of the houses and streets by electricity. The Corporation have decided to carry out the work at a cost of £12,000, and will apply to the Local Government Board for power to borrow this sum.

At the meeting of the Gravesend Town Council last Wednesday, Mr. Berkowitz, in accordance with notice (*ante*, p. 478), proposed that the resolution of the 4th ult. on the subject of the electric light should be rescinded with a view to a poll of the inhabitants being taken. He stated that he would rather submit to monopoly than see the town ruined by a scheme which meant exorbitant rates, empty houses, and general financial embarrassment. He did not consider the time ripe for the adoption of electricity in Gravesend. Mr. Penny seconded the motion; but, upon a division, it was lost.

Eccles is not yet gathering in the shekels which, it was expected, the Corporation electric lighting installation was going to produce. On the contrary, there is a deficit on the working. Two reasons for this are given—first, the enhanced price of coal; and, second, the loss on the day load. Of course, "the enhanced price of coal" was a very good card for Alderman Kendall to lead with in explaining the position to the Council on Monday last week. In order to effect a change in the position, he stated that arrangements had been made to economize on the day load, to increase the supply according as the demand arose, to double its present volume, and to introduce a new scale of payments. The last "arrangement" being one of the easiest to carry out, the Council have already agreed to a revised scale of charges.

Electric lighting companies must be careful not to secure custom by misrepresentation. At the Kidderminster County Court last Tuesday, a case was heard in which Mr. H. G. Ivens, a Solicitor, sued Mr. Stevenson, an official of the Kidderminster Electric Lighting Company, for £3 12s. 6d., by reason of alleged false representations as to the terms upon which the Company would supply him with the electric light. Plaintiff stated that in the autumn he inquired as to the cost of electric lighting for his office, and gave an order for the work to begin. Subsequently he discovered there was a minimum charge of 12s. 6d. per quarter; and he ordered the supply to be cut off. He saw defendant on the matter, and the latter told him that he need not trouble himself, as he would only be charged for the electricity he actually used. This defendant denied; but after a long hearing, his Honour said he felt certain Mr. Ivens had been misled, and gave judgment for the amount claimed.

A conference was held at the Board of Trade last Wednesday of representatives of the London County Council and Metropolitan and Provincial Electric Light Supply Companies and others, with reference to the proposal of the Board of Trade to reduce the maximum charge for electric lighting from 8d. to 6d. per unit. Sir Courtenay Boyle, who presided, after several delegates had spoken, said the Board of Trade were not in the least disposed to take any step which would discourage the provision of electrical energy. On the contrary, they were most anxious that every facility should be given to encourage in the best possible way the development of electrical science and electrical distribution. The decision of the Board would be this—that it would not be a hard-and-fast rule to reduce the 8d. per unit to 6d.; but where good cause could be shown for an 8d. or a 7d. maximum, with or without the sliding-scale arrangement, the Board would take into careful consideration the representations made to them on the matter. He merely wished to point out one thing—that the wholesale consumer took care of himself, but the small retail consumer, who wanted electrical energy for a short time and not in a large quantity, must rely upon the maximum limit of charge, as he could not do otherwise.

At the meeting of the Manchester City Council last Wednesday, Dr. Bishop, in submitting for confirmation the minutes of the Electricity Committee, referred to their decision not to entertain new applications for current, alluded to in last week's "Notes." He said there was a misapprehension in the public mind with regard to the supply of current for electric lighting. It seemed to be thought that the Committee were deliberately withdrawing the supply of power to ordinary customers so as to use it for tramway purposes. This was a misapprehension. They had at the present time sufficient power to enable them to take on a considerable number of consumers for lighting purposes; but if they were to do so, they might find, when they came to bear the heavy load in October, that they would be in the position of having to disconnect them again. The Committee thought it was only right and honourable to tell would-be consumers that there was a doubt as to whether they would be able to continue to supply them beyond September if they took them on now, and that it would be better if they waited until the Committee were satisfied that they could supply them with current. The action now taken was simply temporary. Since the Committee's intention became known, they had received applications for 10,000 8-candle lamps; bringing up to 60,000 the total awaiting connection.

Mr. R. H. Bicknell, M.Inst.C.E., recently held an inquiry, on behalf of the Local Government Board, into an application for their sanction to the raising of £157,000 by the Oldham Corporation for the purposes of electric lighting and traction. The Town Clerk (Mr. A. Nicholson) explained that the first Order for electric lighting purposes was obtained in 1890, and in 1892 active operations were commenced. The present was the fifth application made by the Corporation for borrowing powers. The first was in 1892, when they asked for £40,000. Actually £27,000 was required, and only this sum was borrowed. In 1895 powers for £15,000 were obtained; in 1896, for £10,000; and in 1900, for £36,000—making a total of £88,000. He read a statement showing the progress of the undertaking from the year ending March 25, 1895, when there was a loss of £152 12s. 5d. The net profit the second year was £847 14s. 8d.; in 1897, £1043; and in 1898, £1350. The net profit for the present year was £18 17s. 2d. In the course of a comparison between the first year of the undertaking and now, he said that in 1895 the gross revenue was £1915 16s. 4d. and the gross expenditure £1271 18s. 3d.; whereas in the year now closing the former had been £9230 and the latter £5346. Professor Kennedy, who has been the adviser of the Corporation since the inception of the scheme, explained it to the Inspector, and in the course of his remarks referred to the growth of the demand for current for lighting purposes within the borough. In the year ended March, 1895, 69,000 units were sold; in the second year, 147,000 units; in 1897, 228,000 units; in 1898, 322,000 units; in 1899, 456,000 units; and in 1900, 577,000 units. The estimate for the current year was 610,000 units. At the close of the inquiry, the Inspector visited the present station and the site of the proposed new station.

The proposal of the Sudbury Corporation to spend upwards of £20,000 on a scheme of electric lighting for the borough is encountering considerable opposition; and a public meeting to protest against the action of the Town Council was held in the Corn Exchange last Tuesday evening, while another, and more influential one, was convened for last night. Alderman Grimwood occupied the chair, and made a telling speech against the Corporation embarking on expenditure which would increase the rates at least 1s. 9d. in the pound. If they did something now, they would do good; otherwise, they would go from bad to worse. There was nothing begun, and nothing done yet. They could stop now, and recover; but when they were all in bankruptcy, when their rates were doubled, when their best men were gone, and all their houses stood empty, what would be the good of stopping then? Mr. Bailey followed, and was well received. He advised the ratepayers not to trust the Mayor's statement that the electric light would bring in a good return, but have gas as they had before. He proposed the following resolution—"That this meeting strongly protests against the action of the Corporation in introducing the scheme of electric lighting, whereby the enormous sum of upwards of £20,000 is proposed to be expended; and in view of the large amount already proposed to be expended on sewerage, calls upon the Council to abandon the scheme as wasteful and extravagant." Mr. Fenton seconded the motion. Looking at the matter from a business point of view, he considered it altogether out of the question for a small town like Sudbury to propose to take on a debt like that suggested. Mr. Phillips, in a vehement speech, protested against the proposed expenditure. The motion was carried. A collection was made to defray expenses; and signatures were requested to a memorial against the scheme.

Mr. Robert Hammond has been lecturing the residents of Hendon on the advantages of electric lighting. The District Council have had under consideration a scheme involving an initial expenditure of £36,400; and they are now contemplating taking steps to carry it out. Mr. Hammond's services were secured; and, after his twenty years' experience, he was, of course, better able than some others to make out a good case for electric lighting. He told his audience that he thought with a charge of 6d. per unit they would be able to cover all working expenses, pay interest and sinking fund charges, and be £500 to the good. At the same time, when citing instances of local authorities' electric light supplies, he had to acknowledge that 14 out of 60 undertakings in respect of which returns are made to the Board of Trade managed to come off with a deficiency to the extent of £48,000. The lecturer had things pretty much his own way at the Public Hall, though the electric lighting scheme met with some criticism as a commercial speculation; but on the question of electricity *versus* gas as an economical illuminating agent, he found a doughty opponent in the columns of a local paper. Mr. C. H. Rutter, the Engineer and General Manager of the North Middlesex Gas Company, was able through that medium to lay before the Hendonites a few instructive figures on the subject. We need not follow him through his calculations, but will give a summary of his conclusions. Taking electricity at Mr. Hammond's price—6d. per unit—and gas at 4s. per 1000 cubic feet, he shows that the respective costs of gas and electricity to give the light of 80 standard candles during 1000 hours would be: Gas, 1 lamp × 4½ cubic feet × 1000 hours, or 4500 cubic feet, at 4s. = 18s.; electricity, 5 lamps × 16-candle power × 3¾ watts × 1000 hours, or 300 units, at 6d. = £7 10s. "After studying such figures as these," he says, "which are purposely made as favourable as possible to electric light, it is inconceivable how a body of sane commercial men, as the Hendon Council is supposed to be, could entertain

for a moment the idea of encumbering a district such as this with an expenditure of £50,000; and for what? For pure vanity. To be able to say 'We have the electric light at Hendon.' To compete with that hated monopolist—the Gas Company. Let them be assured that their electric light never can, and never will, compete with incandescent gas lighting until they can sell electric energy for less than 1d. per unit." In conclusion, he quotes from Sir William Preece's well-known report to the Maidstone Corporation on the cost of electric glow lamps and incandescent gas-lights for the public thoroughfares. On the whole, Mr. Rutter may take credit for having scored a point.

Sir Courtenay Boyle resumed on Thursday, at the Westminster Town Hall, the inquiry commenced on the 1st inst., and reported in last week's "Notes," relative to a proposed alteration in the regulations with reference to electric lighting, the effect of which would be that, instead of a change in the pressure at which electricity is supplied to any premises being made only with the consent of the consumer, it may be made "on such terms and conditions as may be agreed upon between the undertakers and the consumers, or failing agreement, as may be settled by an arbitrator appointed by the Board of Trade." It may be remembered that the power of the Board to alter the regulation was questioned on the previous occasion by Mr. Danckwerts, on behalf of the Corporation of London; and the matter was left in abeyance. At the re-opening of the proceedings, Sir Courtenay Boyle said he was now in a position to rule that the Board of Trade, in their own opinion, had such power. Mr. Moon, for the Chelsea Electricity Supply Company, said there were no objectors to the change in Chelsea; but the Company were afraid there were a great number of uninformed people who might object to the introduction of the 200-volt current into their houses, either because they thought it would be dangerous, or because it would involve more interference with their premises than would actually be the case. The Company, therefore, thought the right of veto should not rest with the consumers, but with an independent arbitrator. Mr. Percy Still, Chief Engineer of the Company, gave evidence in favour of the change. In cross-examination, he said the alteration sought would not increase the risk of fire. Mr. S. Baines, formerly Electrical Engineer to the Bradford Corporation, and now filling a similar position with the St. Pancras Borough Council, said Bradford was the first Local Authority to undertake the supply of electricity, and they commenced with a pressure of 115 volts. After four years' working, they found the mains were full; and to avoid increasing them, with the attendant inconvenience to the traffic which would be involved, the Corporation commenced to double the pressure and supply energy at 230 volts. St. Pancras was the first to double the voltage. They met with stubborn resistance in four or five cases, and this had prevented them from economically effecting the change, and led to their duplicating the mains. Mr. W. H. Massey said he had been authorized to ask, if any alterations were made in the regulations, that protection should be afforded to the Crown when it came to a question of overhauling the wiring of 2000 or 3000 lamps in the State rooms of Buckingham Palace. He found the cost would be about £1500. But the supplying Company, rather than pay that sum, preferred to continue at 100 volts as before; and in order to supply current at the lower voltage, they charged more than they did for the higher. No one would object to 200 volts for new installations; but there were many buildings besides the Royal Palaces where the change would mean very serious cost. He asked that, if the change were made, the words "provided always that none of the cost of conversion shall be borne by the consumer" should be added to the regulation. He was instructed to make this representation on behalf of the Crown. Colonel Crompton gave evidence favouring the change; and the inquiry was again adjourned.

HULL CORPORATION WATER SUPPLY.

The Effect of Inspection and Waste Prevention.

The Water and Gas Engineer of the Hull Corporation (Mr. F. J. Bancroft, B.Sc., Assoc.M.Inst.C.E.) has lately presented to his Committee his fourth annual report, embracing the work of the Water Department for the year ending Dec. 31 last. He states that the rainfall in that period was, with two exceptions (1892 and 1895), the heaviest since 1883; being 27·4 inches. The yield from the wells at Springhead was 1,878,371,000 gallons; from those at Cottingham, 1,491,398,000 gallons—together, 3,369,769,000 gallons, as compared with 3,239,966,000 gallons in 1899. The greatest quantity pumped at Springhead on one day last year was 8,128,000 gallons, on the 20th of July; and at Cottingham 5,498,000 gallons, on the 14th of February. The bulk of water pumped last year was delivered to an estimated population of 242,000 within the limits; the average per day being 9,196,000 gallons, or 38 gallons per head for all purposes. There were 789 meters in use; and 724,005,000 gallons of water passed through them. The average domestic and unmetered trade supplies were 7,212,000 gallons per day, or at the rate of 29·8 gallons per head. A considerable reduction in the rates for water was effected last year. From the 31st of March, the charge of 10s. per annum for private baths was abolished; a reduction of 25 per cent. was made for lock-up and combined shops; and the meter-rate was reduced to a uniform 6d. per 1000 gallons. These reductions amounted altogether to £4420 per annum, or equivalent to 8 per cent. upon the gross income.

During the past two years, there has been instituted a house-to-house inspection of all the premises supplied with water; but only a portion of the work has been completed. Altogether, 16,358 premises have been inspected, and the result has been to reveal many cases where the annual charge was altogether inadequate for the quantity of water used; and in such instances meters have been fixed. Last year 84 night inspections were made, and waste was detected in 3678 bib-taps, 376 water-closet apparatus, and 260 lead pipes, to say nothing of ball and stop taps, &c. The whole of these defective fittings were repaired or replaced. New bye-laws have been approved by the Local Government Board; and Mr. Bancroft hopes the provisions made therein for testing and stamping fittings will be the means of raising the standard

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 675.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	19½—20½	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13½—14½	..	5 3 5
300,000	100	Jan. 2	5	Australian 5 p.c. Deb.	99—101	..	4 19 0
200,000	5	Nov. 14	6	Bombay, Ltd.	6—6¼	..	4 12 4
40,000	5	,,	6	Do. New, £4 paid	4¾—4¾	..	5 6 8
380,000	Stk.	Feb. 14	12	Brentford Consolidated	258—263	..	4 11 3
270,000	,,	,,	9	Do. New	185—190	..	4 14 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	128—132	..	3 15 9
159,375	,,	Dec. 13	4	Do. 4 p.c. Deb.	113—116	..	3 9 0
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	227—232	+2	4 6 2
226,320	,,	,,	7	Do. A. Ord. Stk.	160—165	..	4 4 10
1,022,500	Stk.	Feb. 27	5	Bristol, 5 p.c. max.	121—123*	..	4 1 4
420,000	20	Sept. 28	10	British	40—42	+1	4 15 3
50,000	10	Feb. 28	12	Bromley, Ord. 10 p.c.	24—26*	..	4 12 4
79,000	10	,,	9	Do. 7 p.c.	19—21*	..	4 5 8
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	8—8¼	−¼	7 1 2
220,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	97—100	..	4 0 0
150,000	20	July 12	8¼	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	14—15	..	5 6 8
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Oct. 12	12½	Commercial Old Stock	277—282	..	4 10 5
236,425	,,	,,	9½	Do. New do.	208—213	..	4 11 7
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	132—137	..	3 5 8
800,000	Stk.	Dec. 13	9	Continental Union, Ltd.	162—167	..	5 7 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165	..	4 4 10
575,000	Stk.	Feb. 28	5	Crystal Palace Ord. 5 p.c.	115—120*	..	4 2 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	127—132*	..	3 14 1
486,090	10	Jan. 31	11	European, Ltd.	19—20	+½	5 10 0
354,060	10	,,	11	Do. £7 10s. paid	14—15	+½	5 10 0
15,079,885	Stk.	Feb. 14	4 5/16	Gas-light and Coke	4 p.c. Ord.	..	4 9 9
2,600,000	,,	,,	3½		3½ p.c. max.	..	3 16 11
3,799,735	,,	,,	4		4 p.c. Con. Pref.	..	3 9 0
4,063,425	,,	Dec. 13	3		3 p.c. Con. Deb.	..	3 3 10
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13½—14½	+½	5 10 4
3,800,000	Stk.	Nov. 14	10	Imperial Continental	212—217	..	4 13 11
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 28	10	Liverpool United A	227—229*	..	4 5 6
678,100	,,	,,	7	Do. do. B	163—172*	..	4 0 0
306,083	,,	Dec. 28	4	Do. do. Deb. Stk.	120—122	..	3 5 7
75,000	5	Dec. 13	6	Malta & Medn., Ltd.	4½—5	..	5 14 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	106—109	..	4 11 9
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	104—106	..	4 4 11
541,920	20	Nov. 14	3½	Monte Video, Ltd.	9½—10½	..	6 13 4
717,946	Stk.	Feb. 22	8½	Newc'tle & G'tesh'd Con.	225—227*	+1	3 14 11
312,855	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	101—102	..	3 8 8
150,000	5	Nov. 29	8	Oriental, Ltd.	7—7⅞	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	5⅞—6¼	..	5 15 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅝	..	4 11 5

*Ex. div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Feb. 28	7	Ottoman, Ltd.	5¼—5¾*	..	6 1 9
851,070	10	Oct. 12	7	River Plate Ord.	10¾—11¼	+¼	6 4 5
250,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
250,000	10	Sept. 28	8	San Paulo, Ltd.	11—12	..	6 13 4
135,000	Stk.	Sept. 14	10	Sheffield A	232—236	..	4 4 9
209,984	,,	,,	10	Do. B	232—236	..	4 4 9
523,498	,,	,,	10	Do. C	232—234	..	4 5 6
5,761,885	Stk.	Feb. 14	5	South Met., 4 p.c. Ord.	130—133	..	3 15 2
1,547,965	,,	Jan. 16	3	Do. 3 p.c. Deb.	93—96	..	3 2 6
380,940	Stk.	Nov. 14	5	Southampton Ord.	105—110	..	4 10 11
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
120,000	Stk.	Feb. 28	6	Tottenham and	A. 5 p.c.	..	5 1 8
250,520	,,	,,	4½		B. 3½ p.c.	..	5 0 0
80,100	,,	Dec. 13	4	Edmonton	4 p.c. Deb.	+1	3 10 2
182,380	10	Jan. 16	5	Tuscan, Ltd.		..	5 11 1
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—102	..	4 18 0
230,000	5	Feb. 28	9	West Ham, 10 p.c.	9—10*	..	4 10 0
147,000	10	,,	6	Do. 7 p.c.	11½—12½*	..	4 16 0
128,984	Stk.	Dec. 28	4	Do. 4 p.c. Deb	108—113	..	3 10 10
				WATER COMPANIES.			
780,499	Stk.	Dec. 28	11	Chelsea, Ord.	298—303	..	3 12 7
150,000	,,	,,	5	Do. 5 p.c. Pref.	155—160	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	142—145	..	3 2 1
175,785	,,	Sept. 28	4½	Do. 4½ p.c. Deb.	143—148	..	3 0 10
1,720,560	Stk.	Oct. 12	7	East London, Ord.	190—195	..	3 11 10
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	145—150	..	3 0 0
797,687	,,	,,	8	Do. 3 p.c. Deb.	95—97	..	3 2 6
700,000	50	Dec. 13	8	Grand Junction	10 p.c. max.	..	3 12 1
310,000	Stk.	Sept. 28	4		4 p.c. Deb.	..	3 1 7
708,000	Stk.	Feb. 14	14	Kent		..	4 12 5
160,000	,,	,,	7	Do. New, 7 p.c. max.		..	3 8 4
1,043,800	100	Dec. 28	10½	Lambeth, 10 p.c. max.	280—285	−3	3 13 8
406,200	100	,,	8	Do. 7½ p.c. max.	208—213	..	3 15 1
350,000	Stk.	Sept. 28	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
500,000	100	Feb. 14	13¾	New River, New Shares	410—415	..	3 6 3
1,000,000	Stk.	Jan. 31	4	Do. 4 p.c. Deb.	127—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and	Ord.	..	3 11 10
126,500	100	,,	7		7½ p.c. max.	..	3 17 9
489,200	Stk.	,,	5		5 p.c. Pref.	..	3 2 6
1,019,585	,,	Oct. 12	4	Vauxhall	4 p.c. A Deb.	..	3 1 7
1,155,066	Stk.	Dec. 13	10	West Middlesex		−4½	3 10 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb.		..	3 2 1
200,000	,,	Sept. 14	3	Do. 3 p.c. Deb.	97—99	..	3 0 7

*Ex. div.

and of minimizing the avoidable waste. The whole of the plant has been maintained in good working order; and the two new engines started in August have fully realized the expected economy in coal consumption. During the year, 11·61 miles of new mains were laid, and 169 fire-hydrants fixed. Allowing for the pipes taken up, there were in use at the close 208·03 miles of mains.

Accompanying the report is a comparative annual statement of the water supply to the borough from 1893 to 1900. It shows that for all purposes the quantity per head per day has been reduced from 43·5 gallons in 1893 to 38 gallons in 1900; being a saving of 5·5 gallons per head, or, approximately, 1⅛ million gallons per day on the present population. Considering the domestic and unmetered services alone, the saving is more marked; the supply having been reduced from 38·3 gallons in 1893 to 29·8 gallons per head per day in 1900; equalling 8·5 gallons saved, which, on the present population, is equivalent to 2 million gallons per day. This saving has enabled the Committee to sell by means of meters the large quantity of 2½ million gallons of water daily; being double the amount sold by measure seven years ago. For the first time, the domestic supply is under 30 gallons per head per day. Mr. Bancroft remarks, however, that much remains to be done; and it is only by constant supervision that the waste can be kept down—"the consumers in general being apathetic, and failing to appreciate the importance of so-called small leaks."

WATER PURIFICATION IN WASHINGTON (U.S.A.).

Slow Filters and Preliminary Sedimentation.

We learn from the "Engineering Record" that Messrs. Rudolph Hering, G. W. Fuller, and Allen Hazen have lately submitted to the Senate District Committee a report on the purification of the Potomac River water for the supply of the district of Columbia. It reviews all the evidence collected by earlier investigations at Washington, in the light of experience and investigations elsewhere, and closes with recommending the use of slow filters with auxiliary works for preliminary sedimentation and the use of a coagulant for a part of the time. With regard to the plans already made, the report runs as follows: "As to the relative merits of the two systems of purification studied by Colonel Miller—viz., the treatment of plain subsided waters by sand and mechanical filters—his conclusion is correct that the latter system would be the more efficient and the more judicious one for the city of Washington to adopt. Since his investigations were instituted, some improvements have been made in the general processes of both slow and rapid filtration. Relative to the former, this process applies, for very turbid clay-bearing waters, when needed. This procedure was studied at length at Cincinnati, and is used at a number of small places in Europe. It is referred to in Colonel Miller's report as the modified English system. It was not investigated by him, owing to lack of funds; and in the absence of practical results, he did not consider it." As it is this unusual system which is recommended by the Consulting Engineers, the reasons for its adoption are of special interest.

The character of the raw water is often the controlling element in the selection of a process for its purification; slow or sand filters being generally best suited for waters not extremely turbid, and rapid or mechanical filters having marked advantages for clarifying and purifying waters which are very turbid for considerable periods. The Potomac River in this respect has a middle place among the well-studied American streams. Ten parts per million are suspended matters in the Merrimac at Lawrence, 15 parts in the Hudson at Albany, 50 parts in the Allegheny at Pittsburg, 80 parts in the Potomac at Washington, 230 parts in the Ohio at Cincinnati and 350 parts at Louisville, and 560 parts in the Mississippi at New Orleans. None of the waters filtered by the better-known European sand filters approach, on an average, the turbidity of the Potomac water. It is also important to note that the periods of highly turbid water last too long for the intakes to be closed and the district to rely upon storage in reservoirs at such times.

Plain subsidence of the Potomac water for any reasonable period would probably fail to afford an adequate clarification for its successful purification by slow filtration. During some years, the records indicate, subsidence might be an adequate preparation for filtration; but in other years it would be insufficient for periods amounting to ten weeks in the year. Moreover, there is a danger of reducing the bacterial efficiency of the slow filters by excessive turbidity at such times. The experiments at Cincinnati show that under Washington conditions this reduction in efficiency may occur during somewhere about 8 per cent. of the year.

Since the investigations by Colonel Miller were completed, there have been material improvements in rapid filters; and if the Potomac water were more turbid, or turbid for longer periods than the records show, such filters would surely have been given the preference. The Consulting Engineers also had the advantage of a thorough knowledge of the experiments in America and the practice abroad in coagulating water before passing it through slow filters. The choice plainly lies, therefore, between these two systems. The slow filters have a little higher bacterial efficiency in summer and a little lower in winter; the two systems are found to cost about the same when interest and depreciation charges are added to the cost of operation; and the selection finally hinged on the long and favourable experience with sand filters as evidenced by the health of the communities using the water from them. This fact, it was stated, should have greater weight attached to it than the present evidence that rapid filters are able to give substantially equal hygienic efficiency as the older slow type.

Our contemporary expresses the hope that this report will settle the matter, not only of the purification of the Washington water supply, but also of the relative advantages of slow and rapid filtration. It tersely and emphatically states the situations where one or the other is to be given the preference. It is expressing only the common-sense view of a business proposition when, two equally good courses being open, it advises the adoption of that known to have the longer successful record

CARBURETTED WATER-GAS APPARATUS

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	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN	1,250,000	WINNIPEG, MAN.	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	COLCHESTER (Second Contract)	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD	2,250,000	KINGSTON, ONT.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHEDE (HOLLAND)	150,000
OTTAWA	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250,000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRETFORD	500,000
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
ST. CATHERINES (Second Contract)	250,000	NEWPORT (MON.)	250,000
BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Mr. High, of the Town Council of Dundee, the self-imposed censor of the Corporation gas undertaking of the city, makes a monthly appearance in his capacity of grumbler at the quality of the coal supplied. At this week's meeting of the Town Council, he referred to the report on the gas coal analysis, and asked what progress was being made in dealing with the defaulters. He said he found, in the February analysis, that there was a loss of £90 on one lot alone. The consumption of gas had been less this year by several million cubic feet compared with the previous year, and yet they had £6439 more income. Even after allowing for the increase of 6d. in the price of gas, the income should not have been so much as that; and there must be something very far wrong. If they sold so much less gas and had so much more income, they must be "doing" somebody. He had heard it stated that air got into the gasholder, and that this was the cause of the "burr" occasionally heard in the meters. Therefore they were paying 3s. 10d. for air instead of gas. Mr. Ballingall said he would not follow Mr. High in his speech on the manufacture of gas. As regarded the defaulters, the matter would be reported to the next meeting of the Committee. The absurd notion that air is deliberately mixed with gas is persistently held in Dundee. It is hardly heard of anywhere else.

The report of Mr. J. Kincaid, the Manager of the Falkirk Corporation Gas-Works, upon the capability of the existing works to cope with the increasing demand for gas, has been submitted to the Town Council this week. It is a document of some length, dealing with the subject in detail. It is shown that the maximum daily make of gas has risen, year by year, from 468,900 cubic feet in 1895-96 to 661,000 cubic feet last year. At the same rate of progress, Mr. Kincaid estimates that in 1902-3 the maximum daily make will be 760,000 cubic feet. The total carbonizing capacity of the works he states at 753,600 cubic feet a day. He anticipates, therefore, that in the winter of 1902-3 the demand for gas will be greater than the works will be capable of meeting. The total quantity of coal they are able to store is 600 tons, only half of which is under cover. With a daily requirement of 80 tons, only 7½ days' supply can be stocked. The purifier area is 1260 superficial feet; whereas, with an output of 753,000 cubic feet of gas per day, it should not be less than 2000 superficial feet. Purifying by oxide of iron had to be abandoned last season, owing to lack of covered revivifying space. The accommodation for lime is only about one-third of the desirable size. During the months of heaviest output, the purifiers have frequently to be loaded before the lime has been properly prepared—a system which is not conducive to satisfactory or economical working. The dangers, he concludes, attending the production of gas in such a confined area as this cannot be minimized. Gas can only be produced with safety by having sufficient room in, and distance between, the sections. Two years ago he reported that the time had arrived for dealing with the question of the removal of the works to a larger site. Matters have now assumed a more serious aspect; and he considers that no time should be lost in the erection of new works. In moving the adoption of this report, the Convener of the Works Committee (Mr. H. Russell) truly observed that it was not merely, as usual, the opinion of an individual, but what he might safely term a correct and actual record of facts from the books of the Corporation. They were taking from their retorts something like 166,000 cubic feet of gas per day more than they did two years ago, otherwise they would have been in a very critical state. Then Mr. Russell pointed out that their difficulty about the new site for the gas-works at Thornhill was the want of railway accommodation, which, curiously, was the result of the agreement between the Railway Companies as to their respective territories. It was simply a question of tolls, which the Railway Companies could not settle. He suggested that, instead of writing to the Companies, they should have a meeting with the Companies' representatives, and endeavour to ascertain what they proposed doing. There was no difficulty whatever in agreeing to Mr. Kincaid's report.

There was, however, a long discussion over a recommendation by the Committee that Mr. Kincaid should be instructed to get estimates for a month's supply of splint coal. Mr. Christie professed to see a principle in the purchase of coal, which was that all tenders should be submitted to the Committee first. He stuck to his point tenaciously, but did not carry it. It is a subject which is often raised; and it is one upon which no general rule can be adopted. It is just possible that, on this occasion, the intention is to close with an offer of coal without the details of the transaction being disclosed even to a Committee. It is desirable that annual contracts should be concluded with all the solemnities of statute or usage. But special requirements are different; and every instance must be dealt with upon its own merits.

The Town Council also had before them a report by the Finance Committee, in speaking to which Mr. H. Wilkie, the Convener, said that the gas undertaking was assessed to the amount of £616 for poor and school rates. He was quite well aware that they were assessed in the legal way; but he would like to know what manufacturers would say if it were proposed to assess them upon the profits of their undertakings. Some of the Committee, he said, were taking steps to defeat this most harassing system of taxation. Well, they have a task of no ordinary magnitude before them. It is freely admitted that the existing system has its anomalies; but it has few hardships which any other system than the assumption of a hypothetical tenant would have. For instance, structural value would not be satisfactory unless depreciation were allowed, and in course of time the valuation would vanish; while, on the other hand, were the works to be discontinued, there would be hardship in imposing assessment upon them. The man has yet to arise who is capable of producing a satisfactory solution of the valuation problem.

The Corporation of Aberdeen on Tuesday paid their annual visit of inspection to the gas and electricity works. In the gas-works, special attention was paid to the bench of inclined retorts, which few of the visitors had seen before. After the inspection, refreshments were served

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in the office; and several toasts were duly honoured. Lord Provost Fleming proposed the health of Mr. Kemp, the Convener of the Gas Committee; and Mr. Kemp, in acknowledging the toast, referred to the controversial matters which had been before them recently. He said the visit that day would show them how matters stood; and, having seen for themselves, they would be able to intelligently discuss the question of employment when it came up again at the end of the financial year. Truly, Mr. Kemp could not have uttered words of greater wisdom, because there is no better education for a public man, in the matter of his duties, than to show him how the work he is understood to supervise is actually done. Mr. Kemp also referred to the growth of the gas undertaking. When the Corporation took it over, the consumption was 146 million cubic feet a year; in eight years it had risen to 242 millions; in 1890 it was 338 millions; and last year it was 668 millions. The increase in the current year, to the end of February, had been at the rate of 9 per cent. over the corresponding period of last year. The health of Mr. A. Smith, the Gas Engineer, was proposed; and Mr. Smith, in acknowledgment, said he had now been connected with the Aberdeen Gas-Works for 35 years, having joined before the undertaking was acquired by the Corporation. The price of gas was then 5s. 5d. per 1000 cubic feet; he hoped he would soon be able to reduce it again to 3s. 2d.

The terms of the report of Mr. J. M'Gilchrist, of Dumbarton, to the Town Council of Carnoustie, upon the proposed transfer of the undertaking of the Gas Company to the Corporation, have been made public. Mr. M'Gilchrist arrives at the figure of £10,919 for the undertaking; the Corporation to pay for stocks and the cost of the transfer. In a note to his award, he states that, in his opinion, the most serious defect in the works is the gas storage. To erect a suitable holder, capable of storing a much larger quantity of gas than is required at the present time, would cost a large sum, probably £3500; but this enlightened policy would pay. Whether the Town Council or the Gas Company made the extensions required, the gas consumer will have to pay the cost. In the case of the Town Council, the percentage to be paid on the capital invested would be much lower than the charge the Company can be expected to make. The increased consumption would speedily reduce the interest payable per 1000 cubic feet on the capital expended. The "watering" of the Gas Company's capital was naturally objected to by all gas consumers not shareholders. In years gone by the Company had simply followed a custom that successful gas companies usually adopted, of adding to the capital for extensions made out of revenue. The proper way to stop this was for the Town Council to acquire the undertaking. The valuation obtained by the Directors of the Company from Mr. A. Yuill, of Alloa, was £12,969, the Corporation to take over the stocks at a valuation. On Wednesday night the Directors met, and resolved to offer the undertaking to the Corporation at the price of £12,000. The Corporation are to consider the matter next week. Mr. Yuill's figure is based on a maintainable profit of £680 15s. 5d. a year, which, at 25 years' purchase, would amount to £17,019; but for defective plant in the works he made deductions which reduce the price to the sum recommended—£12,969.

It is always with regret that we see a gas manager get into trouble. This has, unfortunately, happened at Kirkcudbright, where the Corporation gas undertaking—probably reflecting the general financial position of the burgh—has not been in a flourishing state for some time. At the last meeting of the Town Council, it was reported by Bailie Hogg, the Convener of the Gas Committee, that the quantity of coal carbonized (35 tons 16 cwt.) had yielded 282,700 cubic feet. The Convener thought this was a very small make. The Committee had met that night to consider the present unsatisfactory state of the gas-works and the conduct of the Manager, who was not adhering strictly to the rules adopted by the Council. The Committee recommended the Council to terminate the Manager's engagement on the expiry of three months, and to advertise for a successor. Mr. Campbell said it was a shame to do that. They might give him an admonition, and tell him what his duties ought to be. The recommendation was adopted.

In connection with the proposed augmentation of the water supply of Aberdeen, the Town Council have resolved to appoint a consulting engineer of eminence, who will make the requisite surveys, prepare the parliamentary plans for the scheme which may be adopted, and superintend the carrying out of the works. The scheme which is most favoured is that of the Avon, a tributary of the Spey, which would involve very heavy engineering work. It was mentioned that at present the Corporation are taking their limit of supply from the River Dee, and that it will probably be ten years before any new supply can be turned on.

After a good deal of delay, the Town Council of Girvan have decided to proceed with the original scheme of forming a second reservoir at Pinmacher, about a mile beyond the present water-works, with a storage capacity of 15 million gallons. The present reservoir has a capacity of 12 million gallons, and the two will give 27 million gallons in all to Girvan. The estimated cost of the works is about £6000.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 9.

Sulphate of Ammonia.—The activity in the Scotch market, referred to last week, has died out, and values are a shade easier all round. The closing quotations are £10 15s. f.o.b. Hull, £10 16s. 3d. to £10 17s. 6d. f.o.b. Liverpool, and £11 f.o.b. Leith. Except from the Continent, where weather conditions have been very unfavourable, there is good export inquiry; but buyers are somewhat demoralized by low speculative quotations, and their limits are mostly a shade below current prompt prices. In the forward position, makers seem more disposed to modify their prices, but not sufficiently to meet buyers' views, and no important first-hand business is reported.

Nitrate of Soda is firm at 8s. 4½d. to 8s. 7½d. per cwt. according to quality on spot.

LONDON, *March* 9.

Tar Products.—There is no change to note in the markets all round; and there does not seem to be any likelihood of improvement in the

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immediate future. As regards 90 per cent. benzol, there is an absence of business for early delivery; but stocks are very low, and the large quantities which have been used during the season for gas-enrichment would appear to have absorbed the surplus production. As regards 50/90 per cent., there is an entire absence of business, and Continental consumers do not seem to have any interest in this quality at present. Solvent is decidedly better for home consumption; but there is an absence of business for export, which renders it difficult of sale at shipping ports. Crude carbolic acid maintains its value at about 2s. 6d. to 2s. 6½d. according to position. Crystals, however, are quiet; and business is reported at rather low prices f.o.b. London, but only for small quantities. Tar oils of all kinds are in a most depressed condition; and it is very difficult to place them. Notwithstanding the large quantities which are being used for fuel purposes, stocks appear still to increase, while the demand is not so good as it was this time last year. Anthracene is still very dull; and there is really no business doing. Consumers appear to be fairly well supplied for some time to come. Naphthalene salts are rather easier. The large quantities which are now offering for forward delivery are having a depressing effect on the market.

The average values obtaining during the week are: Tar, 14s. to 17s. 6d. Pitch, east coast, 31s.; west coast, 28s. 6d. Benzol, 90's, 10d. to 1s.; 50's, 10½d. to 11½d. Toluol, 1s. 2d. Crude naphtha, 4½d. Solvent naphtha, 1s. 1½d. to 1s. 2d. Heavy naphtha, 1s. 0½d. Creosote, 1d. Heavy oils, 1¾d. Carbolic acid, 60's, 2s. 6d. to 2s. 6½d. Naphthalene, 95s.; salts, 60s. to 75s. Anthracene, "A," 3d.; "B," 2d.

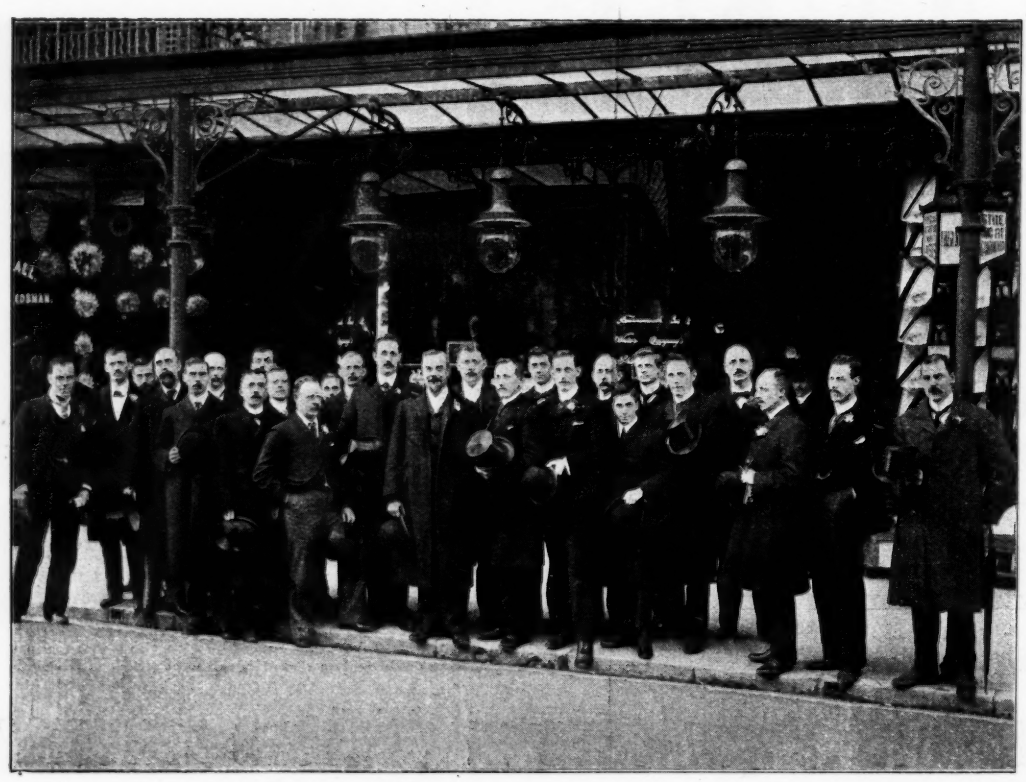
Sulphate of Ammonia.—The market is very quiet indeed. At Leith the demand has ceased for prompt delivery; shippers having evidently covered their immediate requirements. There are sellers at £11. At Hull, however, consumers will not pay more than £10 12s. 6d. to £10 13s. 9d. Liverpool is also very quiet. There are sellers at £10 17s. 6d., while even less has been accepted for small parcels. The position as regards Beckton remains unchanged.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Just now the one thing talked of in the coal trade of this district is the question of how much prices are likely to come down; and there are all sorts of speculative anticipations as to reductions in the very near future. The position is certainly becoming one in which keen competition from the surrounding districts of Yorkshire, Derbyshire, Staffordshire, and the Midlands generally would seem likely to bring about a very substantial re-arrangement of prices; and there is little doubt that when the gas coal contracts come upon the market, they will prove a very severe test of the situation, while the railway companies' contracts will also further stimulate competition, which will in large measure govern the prices for the lower qualities of round coal during the remainder of the year. So far there has been no really appreciable easing down in the better qualities of round coal. These still move off fairly well; and collieries have practically no stocks on hand. The top quotations are perhaps not being readily obtained; but the average figures for the best qualities of Lancashire house-fire coal remain at from 16s. 6d. to 17s. per ton at the pit, with good medium sorts about 15s. to 15s. 6d., and the commoner kinds 13s. 6d. to 14s. In the lower qualities of round coal, there has been a very general drop of about 2s. per ton from the maximum prices of last year; and both from Yorkshire and Staffordshire steam and forge qualities are being pushed on the market here at much below local quotations. For Lancashire steam and forge coals, prices could not now be quoted more than 11s. to 11s. 6d. per ton; while Yorkshire hards are reported in some cases to have been offered at 8s., and Staffordshire common coal is also to be bought extremely low. Of course, the depression in the iron trade largely accounts for this, and would seem at present to be more severely felt both in Yorkshire and Staffordshire than in Lancashire. The competition in engine fuel is even more keen than in steam and forge coals, mainly owing to the depression in the coke trade having thrown large quantities of the cheaper qualities of slack upon the market, and these are being pushed at excessively low-cut figures. In fact, where buyers are in a position to take away surplus clearance lots for prompt delivery, it is scarcely possible to fix any definite price at which business might be done. The better qualities of Lancashire slack are moderately steady; but taking prices all through, they are perhaps 1s. to 1s. 6d. per ton below the previous top quotations, and the reduction of 10d. per ton by the Manchester collieries, which has been partially followed in other districts, simply represents a levelling of list rates to what had previously been actual selling prices. At the pit, best Lancashire slacks may be quoted from about 9s. to 9s. 6d. per ton. The lower sorts are, however, irregular, and range from 7s. to 7s. 6d. up to 8s. 6d. per ton; while common slack from Derbyshire could be bought without difficulty at about 4s. 3d. to 4s. 6d., and inferior slacks from Staffordshire and Yorkshire from 5s. per ton upwards. The shipping trade is extremely quiet; and the very low quotations that are now being made to secure cargoes are evidence that surplus supplies of the commoner qualities of round coal are accumulating at many of the collieries. Ordinary steam coal, delivered at the Mersey ports, could be bought without difficulty at 12s. to 12s. 6d., although some of the better sorts are quoted about 13s. 6d. to 14s. The lower descriptions of coke used for iron-making purposes are hanging more and more on the market, owing to so many of the furnaces going out of blast; something like 50 per cent. of those that supply iron to this immediate district having been either blown out or damped down during the last six months. Yorkshire unwashed cokes have now got down to about 10s. 6d. and 11s. per ton, as average quotations, at the ovens, with Lancashire washed cokes not quoted at more than 14s. Foundry cokes are fairly steady, and good Lancashire qualities could scarcely be bought under about 26s. at the ovens; but North Country foundry cokes are being pushed here at low competing prices.

Northern Coal Trade.—There is a distinctly firmer tone in the coal



Richmond's Managers and Travellers' Conference at Bournemouth.

Outside Boscombe Show-Rooms.

"Good counsellors lack no clients."

Mea. for Mea. i. 2.

trade of the North; but it is mainly shown in the steam coal branch, and is largely due to the placing of orders for the approaching Baltic season. Best Northumbrian steam coals are steadier, and for prompt delivery are now quoted at 11s. 3d. to 11s. 6d. per ton f.o.b.; second-class coals are 10s. 6d.; and steam smalls are 5s. 3d. to 5s. 6d. In the gas coal trade, there is again a quieter tendency, as the quantities sent out on the long contracts are less than they were. Some of the gas companies, however, are buying supplies at the prevailing low prices; but it is thought that they will now have large stocks accumulated. The current price is from 9s. 6d. to 10s. per ton f.o.b. One or two contracts for Swedish towns have been concluded in the last few days at rates near the lower of these figures; but as they are delivered contracts, the exact price is defined by what may prove to be the cost of freight over the season. In the coke trade, there is not much change in prices this week. Best coke is 17s. per ton f.o.b., for export qualities; and blast-furnace coke is 13s. 6d. per ton at the furnaces. Gas coke is very irregular, and the quotation of prices is thus difficult; but possibly 14s. 6d. to 15s. per ton f.o.b. may be taken as the medium quotations.

Scotch Coal Trade.—Trade is stagnant, with little forward prospect and prices going down. There is difficulty in getting the output disposed of; and this is likely to be accentuated so long as prices in the North of England are so much lower than in Scotland. So far as can be seen, it is not probable that there will be any trouble with the miners. The prices quoted are: Main 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow, ell 10s. to 10s. 9d., and splint 10s. 9d. to 11s. The shipments for the week were 149,345 tons—an increase of 14,671 tons upon the previous week, but a decrease of 41,699 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,117,091 tons—a decrease of 464,875 tons upon the same period of last year.

Penrith Gas Supply.—At the last monthly meeting of the Penrith District Council, the Gas Manager (Mr. E. Shaul) presented his annual report. He showed that the quantity of gas made was nearly 49 million cubic feet, against about 45¼ millions in the preceding financial year—an increase of more than 7 per cent. In order to cope with the continued rise in the consumption, an extension of the plant will soon be needed.

Overhead Wire Dangers.—The sudden occurrence of a snowstorm in Vienna last Thursday was the cause of an accident somewhat resembling that which recently occurred in Liverpool. We learn, from particulars furnished by the Vienna Correspondent of the "Daily Telegraph," that, in addition to destroying innumerable telegraph and telephone wires, the weight of the snow broke the overhead conductors of the electric tramway. As a consequence, horses and foot passengers received some severe shocks. Many of the former were killed, while several pedestrians were more or less injured. It is thought that this accident will lead to the abolition of overhead wires, as several persons have already been killed through similar occurrences.

The Substitution of Gas for Electricity at Woking.—The inhabitants of the Station and Maybury Wards at Woking assembled in public meeting a few days ago, and passed a resolution protesting against the proposed substitution of gas for electricity for the public lighting.

Tees Conservancy and the Local Water-Works Schemes.—At a meeting of the Tees Conservancy Commission yesterday week, it was reported that the Darlington Corporation proposed to seek power to erect additional pumping-engines at Broken Scar, and that they would be capable of abstracting from the River Tees upwards of 2 million gallons of water per day. Mr. H. G. Spence said if Darlington were to be permitted to do this, it would have a serious effect upon the upper reaches of the river, which were already very shallow. Mr. James Lowther, M.P., pointed out that the Tees Valley Water Board were also seeking power to supply water to the Hartlepool district. This, he thought, was a more serious matter than the proposals of the Darlington Corporation. Alderman Samuel pointed out that the Tees Valley Water Board were permitted to take 60 million gallons per week out of the river; and when their new reservoir was completed, they would have to compensate the river to the extent of 67,284,000 gallons, so that they were really putting into the river 7 million gallons more than they were taking out. They proposed to supply Hartlepool with some 22 million gallons of surplus water which they had. After further discussion, it was agreed that the Secretary should obtain particulars of Darlington's proposals, and take such steps as might be thought fit in the interests of the Commission. It was also decided to petition against the Water Board's Bill in order to secure a *locus standi*.

Derwent Valley Water-Works and Sheffield Sentiment.—In order to carry out their works, the Derwent Valley Water Board are proposing to open a quarry in, and build a temporary railway to, what is known as the Lady Bower Valley—a spot possessing features gratifying to the eye, and which appears to be much prized by the people of Sheffield. The Water Board, as readers are aware, consist of representatives of Sheffield, Leicester, and Derby; and the Chairman is Alderman Gainsford, of Sheffield. The members of the Board are mostly practical business men, with special knowledge of the requirements of their respective districts; and it may be taken for granted that the representatives would not allow, without a fight, a spoliation of any particularly attractive part of their own districts, without it was absolutely compulsory to the carrying out of the Board's work, for which all three places were separately scrambling not many years since. Now to construct a large embankment, the Board, after having taken excellent advice, have decided that the best stone for their purpose is to be obtained in the Lady Bower Valley; and this they propose to quarry without causing any permanent disfigurement of the valley But the public of Sheffield are determined to resist the Board, and a large meeting of the inhabitants was held on Monday last week to protest against the proposal, and urge the Corporation to use every means in their power to prevent the opening of the quarry. A resolution to that effect was carried; but the Corporation (who are represented on the Board) have no *locus standi*, and all they can do is to support other local bodies who may take up the cudgels on behalf of Sheffield.

KEY.

1. London Suburban Representative.
2. Advertising Department.
3. Boscombe Staff.
4. London Representative.
5. West of England Representative.
6. Stratford Works.
7. Bournemouth Branch.
8. Plymouth Branch.
9. Boscombe Branch.
10. Southern Representative.
11. Boscombe Branch.
12. London Show-Room.
13. London Director.
14. Chairman.
15. Special Apparatus Department.
16. Warrington Director.
17. Bournemouth Branch.
18. East Coast Representative.
19. Foreign Representative.
20. Irish Representative.
21. Advertising Department.
22. Warrington Works.
23. Lancashire and Yorkshire Representative.
24. Midlands Representative.
25. Dublin Branch.
26. Scotch Representative.

Intensified Gas Lighting at Sydney (N.S.W.).—In the report of the Directors of the Australian Gaslight Company noticed in the "JOURNAL" last week, it was mentioned that, in connection with the Commonwealth celebrations, the Company gave a public demonstration of intensified gas lighting in Wynyard Square, Sydney. Particulars of the display were given in a local paper, from which we make the following extract: "Eighteen lamps were ranged round the park, and the required pressure was given by two small water motors worked from the adjacent main, each controlling nine lamps. The Welsbach mantle was used, but made specially strong to resist the extra pressure. Each lamp had a cluster of three lights only. The effect was to convert the darkness of night into the brilliancy of noonday. A flood of light, beautifully white, full of volume and well diffused, spread itself over the whole area—a light one could look at and admire without ill-effect to the eyes—a light of a character never before witnessed in these colonies, free from all the objectionable, if not painful, qualities which accompany the electric arc light. Each three-cluster lamp was burning only the same quantity of gas as the eight-cluster lamp in the street outside—about 30 cubic feet per hour; but while the latter was giving a light equal to only 500 candles, the high-pressure lamps yielded just double this amount, at a cost of only an extra halfpenny per hour—that is, 2d. as against 1½d. In other words, the same consumption of gas doubled the illuminating power. A thousand candles of electric light would look poor indeed by the side of an equal candle power of high-pressure burners."

Kingsbridge Water Supply.—An inquiry was held at Kingsbridge on Tuesday last by Colonel A. J. Hepper, one of the Local Government Board Inspectors, in regard to the application of the District Council for a Provisional Order empowering them to acquire land for the purposes of water supply. Several attempts have been made since the year 1893 to obtain powers for effecting such improvement; but, from one cause or another, they have been unsuccessful. It was stated that Mr. Santo Crimp, the Engineer of the scheme, had examined 14 different sources of supply, all of which were subject to the danger of pollution. The present proposal is to acquire 8 acres of land at a place called Clapton Moor, and to sink wells and drive adits for the purpose of intercepting the underground water. By this means it is hoped to obtain a minimum supply of 45,000 gallons per day, which is equal to 15 gallons per head of the population, and will increase the existing supply to 25 gallons per head. It is, however, estimated that the catchment area will yield a total supply of 21 gallons per head for a population of 10,000 people, should it be required. There are no houses upon it, and about half of it is uncultivated moorland. The water is to be supplied by gravitation to the town; and the scheme includes the provision of a service reservoir. No opposition was offered by the landowners; and though they were represented at the inquiry, it was stated that the only question between them and the Council was that of the compensation to be paid. The cost of the scheme is estimated at about £10,000. Application for a Provisional Order has been rendered necessary by the fact that the land to be purchased is held in trust, and cannot be voluntarily sold.

Suggested Joint Gas Board for Heckmondwike and Liversedge.—The Heckmondwike District Council yesterday week unanimously confirmed a former resolution to promote a Bill in Parliament to construct and incorporate a Joint Board, comprising representatives of the Heckmondwike and Liversedge District Councils, to acquire the Heckmondwike Gas-Works. Mr. T. Redfearn gave an exhaustive report of a meeting of the Joint Committee with the Gas Company, the substance of which showed that the area of supply was to be that of the present Company only; each District Council is to have five representatives on the Joint Board, to be appointed at each annual meeting of the respective Authorities (the chairmanship to be held by each in alternate years); and the purchase price is to be agreed upon, if possible without the expense of arbitration. Allusion was made to the opposition, which was not considered formidable. But the resolution was only carried on the distinct understanding that it did not commit the two Councils to any definite course beyond the promotion of the Bill (which may be withdrawn in the event of satisfactory terms of purchase not being arranged), and that no serious action shall be taken without the consent of the two Authorities.

Gas-Stoves in Bedrooms.—In the "JOURNAL" for the 12th ult. (p. 423), we reported a case of accidental suffocation by gas in Bath. It may be remembered that the Jury accepted the explanation put forward by Mr. W. G. Quicke, who was at the time the Assistant-Engineer of the Bath Gas Company, that the exhaustion of the oxygen in the air of the room extinguished the flame in the gas-stove, and thus left the gas escaping. Acting upon a suggestion of the Coroner, an interesting experiment was subsequently carried out. It was conducted in the presence of Mr. Quicke and Mr. F. Bright, who expressed themselves as satisfied that the conditions under which the experiment was carried out were as nearly as possible identical with those which obtained in the room on the night when the fatality occurred. At 11 p.m. on the 18th ult., the stove in the room where the girl died was lit, the gas-tap being turned on as found on the morning of the 7th; and it remained alight until 5 a.m. on the 19th, when Messrs. Quicke and Bright broke the seals on the gas-tap, union, and door. During those six hours Mr. Thomas Cutler, of Northgate Street, Bath, was locked in the room, in which he had a lighted candle. He states that during the whole time the flame of the stove was not diminished in the slightest degree by want of oxygen or any other cause, and that he did not find the air in the room the least oppressive, and did not once have any feeling of drowsiness. The current of air coming into the room from the door and window was sufficient, he says, to blow out a candle-flame, and was most uncomfortable when sitting in a direct line between them and the stove. Mr. Cutler states that, in a letter which he received from Mr. Quicke, after the experiment, the latter said: "There was a considerable draught of air at the bottom of the doorway; showing that the conditions necessary to bring about a possible result as described at the inquest would not obtain." The "Ironmonger," from which the preceding details have been obtained, says the experiment seems to indicate that the unfortunate girl put the gas out, and then accidentally turned the tap on again.

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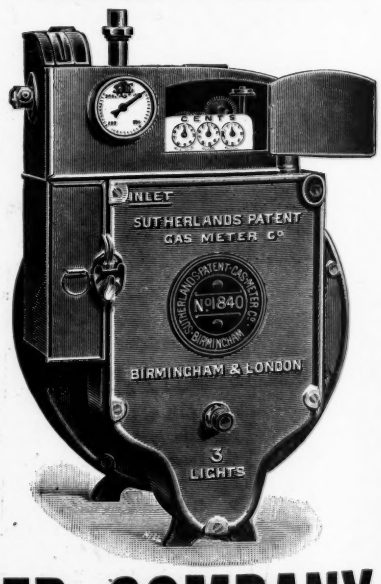

THE SUTHERLAND GAS-METER COMPANY
ESSEX WORKS, BIRMINGHAM.

Reductions in Price.—The Looe Gas Company will reduce their price 4d. per 1000 cubic feet from the 25th inst. The Cleethorpes Gas Company announce a reduction to the ordinary consumers of 3d. per 1000 cubic feet in the price of gas as from the 1st prox. After the current quarter, the price of gas at Ilfracombe will be reduced 2d. per 1000 cubic feet. After the current quarterly reading of the ordinary meters, the price charged by the Hastings and St. Leonards Gas Company will be reduced 4d. per 1000 cubic feet (bringing it down to 3s.) throughout the district. Prepayment meter consumers will receive a similar reduction as soon as the meters can be readjusted.

Devonport Ratepayers and the Poll on the Gas Question.—At the meeting of owners and ratepayers held recently at Devonport, to sanction the promotion of the Bill of the Corporation for the purchase of the gas-works and their opposition to the Bill promoted by the Gas Company for the extension of their powers, somewhat noisy proceedings concluded with a demand for a poll. It is now announced that this has been withdrawn. From the reports in the local papers, it appears that the ratepayer who asked for a poll was of opinion that the subject had not been sufficiently discussed; and his action was intended as a protest against what he regarded as the premature closing of the discussion. He has now been assured by the Town Clerk that the Mayor regrets that the conduct of the meeting towards the close compelled him to put the question to the vote, instead of giving the ratepayer the opportunity to speak which he desired. With this explanation the ratepayer professed himself satisfied; and the poll will, therefore, not now take place.

The New Boring for the Gainsborough Urban District Council.—In connection with the new boring at Gainsborough which was successfully completed last year to a depth of 1515 feet, the Urban District Council in October invited tenders and designs for engines and pumping machinery of a capacity of 50,000 gallons per hour. Ten offers were received, and in due course submitted to the Consulting Engineer, Mr. Percy Griffith, Assoc.M.Inst.C.E., F.G.S., for his consideration and report. In his report, the Engineer recommended the acceptance of the tender of Messrs. Combe, Barbour, and Combe, amounting to £6150, on the ground that, taking into consideration the high duty guaranteed per pound of steam used (97,563 foot-pounds), the annual charges involved by this design would be less than those attending any of the others received. The Water Committee accepted this recommendation; but, on its being brought before the Council, various objections were raised, which ultimately led to the whole matter being referred to Mr. Walter Hunter, M.Inst.C.E., Engineering Director of the Grand Junction Water Company, and one of the Engineers to the Staines Reservoirs Joint Committee. Mr. Hunter's report, which has been submitted to the Council, supports that of the Engineer in every respect. The difference between the tender recommended for acceptance and the one which worked out to the lowest annual charge, was but small; and both Engineers agreed that, on the whole, their selection had the advantage. The matter is to be considered at a special meeting of the Council on the 18th inst.

Incandescent Gas Lighting at Hull.—The Hull papers are expressing much satisfaction at the effect of the incandescent gas-lights which the Engineer and Manager of the British Gas Company (Mr. Andrew Dougall) has lately put up to demonstrate the adaptability and efficiency of this system for lighting public thoroughfares. Experiments are also being carried out, independently of the Company, in another part of the town; and the conclusion is come to that it is just possible, in view of the brilliant results achieved, that "the Corporation will allow a great many more years to elapse before they think of introducing electricity as a general street illuminant."

Dismissal of the Manager of the Teignmouth Gas-Works.—As the result of the recent complaints respecting the gas-works, the Teignmouth District Council decided on Tuesday last to give Mr. T. Stormonth, the Manager, notice to terminate his engagement. It is only fair to Mr. Stormonth to say that the administration of the gas undertaking had been a source of trouble to the Council long before he entered their service; but the difficulties have not decreased of late, and there have been many complaints as to deficiency in the supply and other matters. Mr. W. B. Harris, who moved the resolution requiring Mr. Stormonth to leave, said there were constant troubles with reference to the gas, and of late there had been more interruptions of the supply than had been known for years. The Manager had never tried to work with the apparatus they possessed, and he could not get on with the Clerk, the Surveyor, or the workmen. Mr. J. Cornelius, in seconding the motion, said it would be better to have a manager at £200 a year than go on in the present slipshod way. Mr. W. Bird protested against the matter being dealt with in this summary fashion, and said Mr. Stormonth should be given an opportunity of defending himself against the allegations which had been privately made against him. Mr. G. H. Jarvis also contended that it was an unwarrantable step to dismiss the Manager without more reason than had been adduced. Mr. Stormonth, he said, gave satisfaction in the discharge of his duties until they got amateur gas managers on the Council. Mr. W. F. B. Banbury remarked that they had had a most difficult year, and he wished the motion could be postponed until the next meeting, when they would have a balance-sheet showing the result of the year's working. Mr. F. Slocombe said that no report could remove the friction which existed or the bad name which now attached to the works; and for this reason he supported the motion. The resolution was carried with only one dissentient; but one or two members did not vote. Mr. Stormonth said he had been in the profession all his life, and now he was condemned without a hearing. In the course of the same meeting, one or two references were made to the gas-works. Mr. Bird complained that the accounts were so kept that no one but an accountant could tell the financial position of the gas and water undertakings. Mr. Banbury said the gas accounts had never been kept as they should be since he had been on the Council. He understood the Manager was preparing a balance-sheet for the past twelve months. An estimate of the income and expenditure of the Council for the ensuing financial year was presented. It showed that there was a profit of only £200 on the gas-works account.

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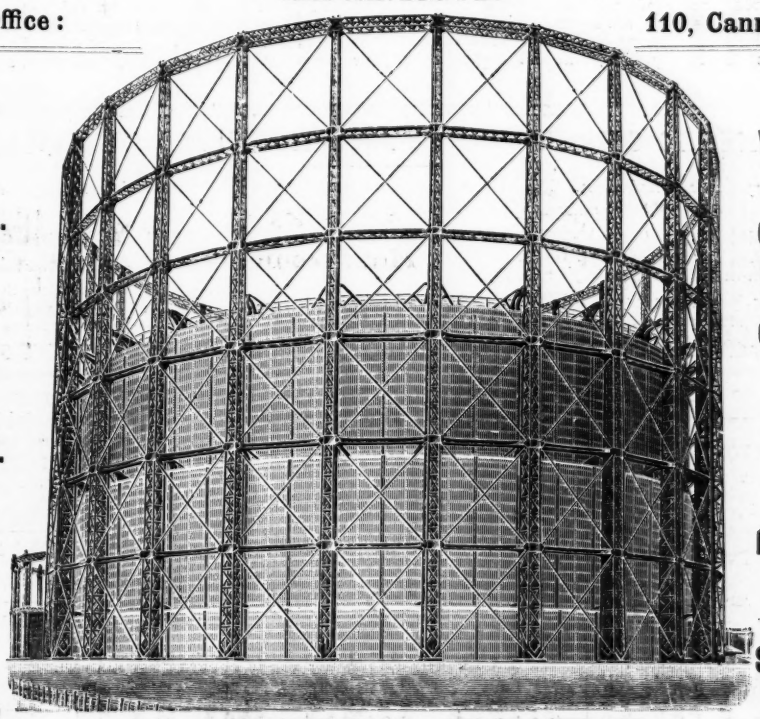

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SLIDE-VALVES, TAR-BURNERS, SIEVES.

Sale of Stock of the Cleethorpes Gas Company.—At a sale of £10,000 of new ordinary stock in the Cleethorpes Gas Company yesterday week, the first lot of £100 sold at £20 premium; the remainder fetching various higher prices up to £129 per lot.

Wallasey Gas and Electricity Finances.—During the past financial year, the Gas Committee of the Wallasey District Council provided £3529, against an estimated surplus of £2091; showing an unexpected income of £1438, in spite of the fact that £4000 more was paid for coal. The Electricity Committee also did very well; producing a profit of £945 against an anticipated profit of £72.

New Mains for the Leeds Water-Works.—At the meeting of the Water Committee of the Leeds Corporation last Friday, it was reported that the fourth 30-inch main from the Swinsty reservoir, in the Washburn Valley, to Eccup, was completed from Arthington to the village of Leathley; and that the 18-inch main from the Headingley pumping-station to Bramley was finished from the station to Kirkstall.

Purchase of the Spalding Water-Works.—At the meeting of the Spalding District Council last Wednesday, it was reported that arrangements had been made for a loan of £30,000, for the payment of the purchase money for the water-works, and for carrying out improvements in connection therewith. The loan is repayable in fifty years, the interest charged being at the rate of 3¾ per cent. The half-yearly payment of principal and interest will be £644.

Award in the Newtown Arbitration.—At the meeting of the Newtown District Council last Thursday, the Gas Committee reported that the amount of the award in the arbitration as to the purchase of the gas-works (*ante*, p. 479) was £32,857. The Chairman of the Committee (Mr. A. S. Cooke) said that this was rather more than they would have cared to pay, but at the same time it was much less than the amount asked by the Company. He thought that, with proper management, the undertaking would be a profitable one.

Belfast Corporation and the Prepayment System.—At the monthly meeting of the Belfast Corporation last Tuesday, the minutes of the Gas Committee contained the report of the Gas Engineer (Mr. James Stelfox) on the subject of laying services into small houses and supplying gas on the prepayment system, which was given in the "JOURNAL" for the 12th ult. (p. 414). Mr. Stewart said he had moved the following resolution at the Committee meeting: "That the Corporation adopt, as an experiment, the penny-in-the-slot meters, and that they be supplied along with a cooking-stove to anyone who applies for same, provided the consumer guarantees to use enough gas to pay the interest on the cost of meter and stove." This resolution was lost—two voting for and four against it. He now moved as an amendment, that the whole question of penny-in-the-slot meters be referred back for reconsideration. There were, he said, prepayment meters in many large towns in England; and he did not see why Belfast should not be similarly supplied. They would lose nothing by adopting the system. Mr. Magee seconded the amendment; pointing out that there was a penny-in-the-slot arrangement in vogue in regard to electric lighting. The Chairman of the Committee (Mr. Young) said he had no objection to the matter being referred back; and this was done.

The Directors of the Shanghai Water-Works Company, Limited, recommend a final dividend of 30s. per share; making, with the interim dividend of 15s. paid in July, 45s. for the past year.

On the recommendation of the Gas Committee, the Torquay Town Council have decided, by 18 votes to 10, to pay Mr. Evans, the retiring Manager of the St. Mary Church Gas-Works, consequent upon the extension of the borough, a sum of £865 as compensation.

Of the total of 3385 fires which occurred in the Metropolis last year, 98 were caused by the escape of gas; and the foolhardy habit of seeking to trace these escapes with a light was responsible for 31 outbreaks. The upsetting of oil-lamps caused 157 fires, and the explosion of lamps 23.

The Gandy Belt Manufacturing Company, Limited, of Seacombe, Cheshire, have just issued a new catalogue of their specialities; comprising their patent cotton belting, their new patent "Duoxolide" composition belting, and their oak tanned leather and improved leather-link beltings, as well as their "Dodge" wood split pulleys.

Owing to a proposal to reduce the piecework rates of cement makers, the men at six of the factories of the Associated Portland Cement Manufacturers, Limited, near Rochester, came out on strike on the 15th ult. The Directors have now given formal intimation to their local Managers that unless the men return to work by the 15th inst. the factories will be entirely closed; and all the day hands have been served with notices accordingly.

According to the Berlin correspondent of the "Financial News," the importation of English coal to Hamburg has considerably decreased in comparison with that of last year. In February it amounted to 146,039 tons, against 167,314 tons in the corresponding period of 1900. On the other hand, it is stated that for the electricity supply works of Berlin the coal supply has been secured from England; and from this arrangement they hope to realize a notable increase in their annual profit.

The report of the Directors of Messrs. James Milne and Son, Limited, for the past year states that the net profit, including the balance brought forward, amounts to £11,189, which they recommend should be applied in paying a dividend at the rate of 5 per cent. per annum on the preference shares, £4771; placing to special reserve fund against preference dividends £700; paying a dividend on the ordinary shares at 4 per cent. per annum, £4000; and placing to the reserve fund £1000. After appropriation of these sums, there will remain a credit balance of £717, which it is proposed to carry forward.

Messrs. Joseph Taylor and Co., of Bolton, have received orders for a solid plate lead saturator (to be constructed on the most modern lines) from the Gas Department of that town. When finished, it will be the strongest the firm have so far made; and it is to be fitted with double detachable ammonia pipes. Its weight will be upwards of 9 tons; and when working, it will be capable of producing between 6 and 7 tons of sulphate per day. The firm have also received instructions to build two large lead sulphuric acid chambers for Messrs. M'Dougall Bros., at their Irk Vale Chemical Works, Middleton Junction.

The "Financial News" learns from New York that the Perrin patents for manufacturing steel tubing have been acquired by an American Syndicate. It has now been decided to form a New Jersey Company, with a capital of about $10,000,000, of which $4,000,000 will be preferred stock. Of this amount $1,000,000 will be paid in cash, and the proceeds received from the sale of these securities will be used in constructing a tube plant. In connection with the formation of the Company, a report from Philadelphia states that the American Iron and Steel Company will be merged into the proposed Tube Company, and that the capitalization of the consolidated concern will be about $40,000,000.

At the annual meeting, last Thursday, of John Wright and Eagle Range, Limited, the report of the Directors, noticed last week, was unanimously adopted. In the course of the address of the Chairman (Mr. G. E. Wright), he remarked that the past year had been an eventful one for the whole of the three businesses amalgamated, and the shareholders would be anxious to know whether the views of the Directors in advocating the amalgamation had been justified by results. They felt more strongly than ever that the decision to amalgamate had been a very good one for the shareholders of both Companies. In the negotiations, no one of the parties had attempted to get the best of the deal; and the sole object of the Directors had been to see that the interests of the shareholders in each Company were maintained. Having referred to the strong financial position of the business, as shown by the balance-sheet, he said the amalgamation had resulted in economies which had helped to swell the profits. But, on the other hand, the Directors had had to face a heavy increase in the price of materials; and therefore the profits had not moved forward to such an extent as appeared from the balance-sheet.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

TERMS OF SUBSCRIPTION to the "JOURNAL."
One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Telegraphic Address: "GASKING, LONDON."
Telephone Number: Holborn 121.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for use in GAS-WORKS.
ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London," London, E.C.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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"Braddock, Oldham." "Metrique, London."

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

PATENTS FOR INVENTIONS.
Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application,
70, CHANCERY LANE, LONDON, W.C.

OXIDE OF IRON OF FINEST QUALITY.
BALE'S Special Fire Cement should be used to keep Retorts, Furnaces, &c., in good repair during the heavy Winter Work.
Send for full Particulars to
BALE & Co., 120 & 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORS, LONDON."
Telephone "277 HOLBORN."

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers, Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS CYCLES at Reasonable and LOW PRICES. Guaranteed and sent on approval. For Cash or Gradual Payments. Catalogue post free. Old Machines Exchanged or Repaired.
MELROSE CYCLE COMPANY, COVENTRY.

PRACTICAL RETORT SETTERS.

GEORGE NUTTALL & CO., 32, Havelock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

BY the adoption of Cripps's Bye-Pass VALVES inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.
Sole Makers: C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SHROPSHIRE.

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, see March 5, p. 647.]

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

R. B. FITZ-MAURICE, 4, East India Avenue, London. Foreign and Colonial SHIPMENTS and CHARTERING promptly attended to. FIRE, LIFE, and ALL CLASSES of INSURANCES effected on the Lowest Terms.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
19, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "LUMINOSITY."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

THE Gas Company advertising last week under No. 3654, for FITTERS, beg to THANK THE APPLICANTS. Those who do not hear immediately will please understand they have been unsuccessful.

WANTED, a Situation as Working Gas MANAGER or FOREMAN by Practical Mechanic. Age 31. Fifteen years' experience in Manufacture and Distribution. First-class References.
Address No. 3657, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Practical Man, a Situation as MAIN and SERVICE LAYER or INSPECTOR. Well up in Large or Small Mains; also Testing same. Has slight knowledge of Meter and Stove Fixing. Good References.
Address No. 3658, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Meter Inspector and REPAIRER. Total abstainer preferred.
Apply, giving Experience, Age, and Wages required, to ARTHUR GRAHAM, Gas and Water Manager, MANSFIELD.

DRAUGHTSMAN wanted by a Firm of Contracting Engineers in the North of England. Must be well up in details of Gas-Works Apparatus.
Apply, by letter, stating Age, Salary, and References, to No. 3656, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-FITTER.

WANTED, immediately, a thoroughly efficient GAS-FITTER. Must be used to Street Lighting Work.
Apply by letter only, stating Particulars, &c., to Mr. H. HECKFORD, 225, CITY ROAD, E.C.

WANTED, a Handy Man, to assist Smith, and to make himself generally useful on Gas-Works.
Apply, stating Age, Wages, Married or Single, with *copies* of Testimonials, to the MANAGER, Gas-Works, NEWMARKET.

WANTED, at once, a General Carbonizing FOREMAN accustomed to Regenerative Furnaces.
Apply, stating Age, Experience, and Wages required, with *copies* of three recent Testimonials, to J. H. BROWN, Gas-Works, ILFORD.

WANTED, a Manager for the Ballymena and Harryville Gaslight Company, Ltd.
Applications, accompanied by Testimonials, and stating Salary expected, to be sent to Mr. SAMUEL HOOD, Chairman, Ballymena and Harryville Gaslight Company, Mill Street, BALLYMENA.

FOR AUSTRALIA.

WANTED, a good Retort Setter. Must have had experience with Inclined Retorts and Regenerative Furnaces. A man from the Midlands preferred. Permanent employment.
Write full Particulars and state Wages required to JOHN TERRY & Co., 7, GREAT WINCHESTER STREET, E.C.

WANTED, immediately, a smart, energetic Young Man as METER INSPECTOR and COLLECTOR. Must be of good address, write a good hand, and be competent to read Meters correctly. Salary to commence, 25s. per week.
Application, with Testimonials, to be forwarded to the MANAGER, Gas-Works, BEXHILL-ON-SEA.

COAL AND CANNEL.

WANTED, by a Factor, several TRAVELLERS (of good address) well known to Gas Engineers. State District known in, what Goods previously travelled in, and with what success, and approximate Salary and Expenses expected.
Apply, by letter, to No. 3653, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SOUTH SHIELDS GAS COMPANY.

WANTED, a Superintendent for the Shields Works of the above Gas Company. Annual Make, 250 million cubic feet. The person appointed must have a thorough practical knowledge of all modern Improvements in Gas Manufacture, and will be under the direction of the Engineer, from whom list of duties may be obtained on application. Salary, £150 per annum. Canvassing, either directly or indirectly, will be a disqualification.
Applications, endorsed "Superintendent," stating Age, Qualifications, Experience, and with *copies* of three recent Testimonials, to be delivered not later than Thursday, March 21, addressed to the CHAIRMAN OF THE GAS COMPANY, Engineer's Office, Gas-Works, SOUTH SHIELDS.

WANTED, Four Good, Second-hand PURIFIERS, not less than 6-feet square, with Water-Valve, complete, and 6-inch Pipe Connections, with 50 yards of 6-inch Main Piping. Also two 14-feet long Wrought-Iron HYDRAULIC MAINS, with 6-inch Ascension and Cross and Dip Pipes.
State Particulars, Price, and where to be seen, to JOSEPH SOUTHERN, Gas Manager, WHALEY BRIDGE.

TO BE SOLD –
One SINGLE-LIFT GASHOLDER, 30 ft. diameter by 10 ft. deep, with five Columns, in excellent condition, equal to new.
Write to J. WRIGHT, Bridge House, Blackfriars Bridge, LONDON, E.C.

FOR SALE—Four Purifiers 10 feet square, complete with Centre-Valve, Connections, and Lifting Crabs and Girders. To be seen at the Cleethorpes Gas-Works.
For Particulars, please apply to R. DEMPSTER & SONS, LIMITED, ELLAND.

FOR SALE, cheap—One, Two, or Three PURIFIERS, 8 ft. square by 4 ft. deep, in good condition, with Valves, Connections, and Lifting Gear.
INQUIRIES for all kinds of SECOND-HAND GAS PLANT will also be esteemed by SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

PURIFIERS FOR SALE.

THE Waterford Gas Company, in consequence of Extensions, have FOR SALE Two 10 feet square PURIFIERS, complete with 10-inch Four-Way Valve Connections. Lutes 18 inches deep. May be inspected at the Works.
Apply to W. B. RONAN, the Company's Secretary, 94, South Mall, CORK.

ASHFORD (KENT) URBAN DISTRICT COUNCIL.

THE Council invite Offers for the following PLANT that has been removed for increased size:—
One 10-inch CENTRE-VALVE (Walker) Three or Four Purifiers on.
One 12 ft. by 12 ft. by 5 ft. PURIFIER.
One 12 ft. by 8 ft. by 5 ft. PURIFIER.
One 8 ft. by 8 ft. by 5 ft. PURIFIER.
One set of LIFTING GEAR for 12 ft. Purifiers.
One set of LIFTING GEAR for 8 ft. Purifiers.
Two 10-inch RACK and PINION VALVES.
One 6-inch FOUR-WAY HYDRAULIC VALVE.
Offers for the whole or any part of the above to be made to the undersigned.
JOHN MORTON.
Gas-Works,
Ashford, Kent.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY Gas Engineer, Thornhill, DEWSBURY.

GAS GOVERNORS for Sale:—
Two 1½-inch STOTT GOVERNORS.
Four 1-inch " "
Three ¾-inch " "
One ½-inch " "
One 12-horse power BRADBEAR GOVERNOR.
One 8-horse power " "
One 6-horse power " "
T. M. DAFFERN, 20, High Street, COVENTRY.

GAS-METERS for Sale:—
Three 3-light METERS.
Two 10-light "
Two 30-light "
Three 5-light "
Three 20-light "
One 50-light "
Also the following SECOND-HAND METERS:—
One 300-light METER.
One 10-light "
Two 5-light "
T. M. DAFFERN, 20, High Street, COVENTRY.

J. FIRTH BLAKELEY & CO., Gas Engineers and Contractors, THORNHILL, DEWSBURY, are the largest Buyers and Dealers in discarded Gas Plant, and have always a large Stock of good Plant to select from, among which the following may be mentioned:—
RETORT IRONWORK, MODERN HYDRAULICS, numerous sizes.
CONDENSERS, up to 12-inch Verticals, 16-inch Annulars.
SCRUBBERS, 3 ft. 6 in. diameter to 7 ft. diameter, with Boards.
WASHERS, "Livesey's," "Clapham's," and "Holmes'" Patents.
EXHAUSTERS, 2000 to 60,000 cubic feet per hour, with Engines.
PURIFIERS, 6 ft. to 20 ft. square.
STATION METERS and GOVERNORS, 4, 6, 10, and 12 inch.
GASHOLDERS, 12 ft. by 8 ft., 20 ft. by 10 ft., 25 ft. by 12 ft., 40 ft. by 16 ft., 50 ft. by 20 ft. guaranteed.
Photographs on Application. Inquiries Solicited. Lists sent.
Telegrams: "BLAKELEY, THORNHILL LEES."

LONGTON CORPORATION GAS-WORKS.

FOR SALE.

THE Corporation of Longton have for DISPOSAL:—
Two CORNISH BOILERS, by Danks of Dudley, each 17 ft. long by 5 ft. diameter; Size of Tube, 2 ft. 6 in.
The Boilers are in good condition, and are fitted with best Gun-Metal Mounts and Gauges. They have been working at a pressure of 60 lbs. per square inch.
Also New FIRE-CLAY RETORTS—
38 lengths 16 in. Round Retorts, 6 ft. 8 in. long, Mouthpiece Ends.
16 lengths 16 in. Round Retorts, 6 ft. 8 in. long, Middle Pieces.
15 lengths 16 in. Round Retorts, 10 ft. long, Mouthpieces.
7 lengths 22 in. by 16 in. Oval Retorts, 6 ft. 8 in. long, Mouthpieces.
4 lengths 22 in. by 16 in. Oval Retorts, 6 ft. 8 in. long, Middle Pieces.
Cast-Iron MOUTHPIECES, ASCENSION and DIP PIPES, for four through Beds of Sevens. Wrought-Iron HYDRAULIC MAINS for five through Beds of Sevens.
Applications to view, and Offers for same, may be arranged by applying to
W. LANGFORD,
Engineer and Manager.
Gas-Works,
Longton, Staffs.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR for Twelve Months from the 25th of March next, at per Ton delivered into Contractor's Tanks at the Company's Works.
Sealed Tenders, endorsed "Tenders for Tar," will be received by the undersigned on or before Saturday, the 23rd inst.; but the Directors do not bind themselves to accept the highest or any Tender.
By order,
W. A. PADFIELD,
Engineer and Secretary.
Gas Offices, Exeter,
March 5, 1901.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE above Council are prepared to receive TENDERS for the supply of LIME, SULPHURIC ACID, WROUGHT-IRON TUBES, GAS and WATER FITTINGS, OIL and PAINT, IRONMONGERY, LEAD PIPE, STATIONERY, &c., as may be required for the Half Year ending the 30th of September, 1901.
Further Particulars and Forms of Tender may be obtained on application to the Engineer, Mr. Octavius Thomas, Gas and Water Offices, Pentre, R.S.O., Glam.
No Form of Tender other than that issued by the Committee will be accepted.
Tenders, endorsed "Contract 1, 2, &c.," as the case may be, addressed to the Chairman of the Gas and Water Committee, to be sent to the undersigned on or before Ten a.m. Wednesday, the 20th inst.
The Committee do not bind themselves to accept the lowest or any Tender.
WALTER H. MORGAN,
Clerk.
Council Offices, Pentre, R.S.O., Glam.,
March 1, 1901.

COUNTY BOROUGH OF SALFORD.
(Gas Department.)

THE Gas Committee invite Tenders for the supply of about 1500 Tons of SULPHURIC ACID, to be delivered during Twelve Months from date of acceptance of Tender.

Full Particulars may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Acid," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, March 21, 1901.

L. C. Evans,
Town Clerk.

Town Hall, Salford,
March 9, 1901.

COUNTY BOROUGH OF SALFORD.
(Gas Department.)

THE Gas Committee invite Tenders for the supply of about 1150 Tons of LIME required for the Purification of Gas at their respective Stations during the Twelve Months from date of acceptance of Tender.

Full Particulars may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Lime," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, March 21, 1901.

L. C. Evans,
Town Clerk.

Town Hall, Salford,
March 9, 1901.

LIVERPOOL UNITED GASLIGHT COMPANY.

TAR.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the TAR produced at their several Works for a period of One Year, from July 1, 1901.

The quantities of Tar produced per annum are estimated to be as follow; but the same cannot be guaranteed, and may be more or less:—

At the Athol Street Works, about			570,000	gallons.
,,	Eccles Street	,, ,,	500,000	,,
,,	Caryl Street	,, ,,	400,000	,,
,,	Wavertree	,, ,,	550,000	,,
,,	Linacre	,, ,,	2,200,000	,,
,,	Garston	,, ,,	350,000	,,

The Tenders may be for the whole, or for one or more of the Works separately, or for a definite quantity from Linacre Works.

Forms of Tender and full Particulars may be obtained on application to the undersigned.

Tenders, sealed and endorsed "Tender for Tar," are to be delivered here not later than the 22nd of March, 1901.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

By order,
William King,
Engineer.

Gas Office: Duke Street, Liverpool,
March 2, 1901.

URBAN DISTRICT COUNCIL OF BUXTON.
(Gas Department.)

EXCAVATION FOR GASHOLDER TANK AND RETAINING WALL.

THE Gas Committee of the above Council are prepared to receive TENDERS for the Materials and Work required in the Construction of a RETAINING WALL and EXCAVATION, &c., for a Gasholder Tank at their Gas-Works, Ashwood Dale, Buxton.

Copies of Specification and Bill of Quantities may be obtained from, and Plans seen at, the Office of Mr. Harold Barker, Gas Engineer, Town Hall, Buxton, on payment of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Excavation, &c., Contract No. 1," to be delivered to the undersigned not later than Saturday, the 23rd day of March, 1901.

The Committee do not bind themselves to accept the lowest or any Tender.

(Signed) Josiah Taylor,
Clerk to the Council.

Town Hall, Buxton,
Feb. 27, 1901.

URBAN DISTRICT COUNCIL OF BUXTON.
(Gas Department.)

GASHOLDER AND STEEL TANK.

THE Gas Committee of the above Council are prepared to receive TENDERS for the Construction of a STEEL GASHOLDER TANK, 102 feet diameter by 24 ft. 6 in. deep, also for a TELESCOPIC GASHOLDER, Inlet and Outlet Pipes, and Appurtenances, to be erected on the Gas-Works, Buxton.

Copies of Specification and Form of Tender may be obtained, and Plans seen, at the Office of Mr. Harold Barker, Gas Engineer, Town Hall, Buxton, on payment of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

The Committee reserve the right to modify the above-mentioned Specification and Plans so as to enable makers of Patent Cable and Spiral-Guided Gasholders, and other persons wishing to avail themselves of patent or other rights or facilities, to Tender in accordance with the Contractors' own designs. Such alternative designs, with complete Plans and Specifications, to be submitted to the Engineer and approved by him before the Tenders are made.

Sealed Tenders, endorsed "Tank and Holder, Contract No. 2," to be delivered to the undersigned not later than Saturday, March 23, 1901.

The Committee do not bind themselves to accept the lowest or any Tender.

(Signed) Josiah Taylor,
Clerk to the Council.

Town Hall, Buxton,
Feb. 27, 1901.

MONTROSE GASLIGHT COMPANY.

THE Directors invite Tenders for the supply during the Year, from the 1st of May, 1901, of 3000 Tons of GAS COAL, viz.:—

1000 Tons of First-Class CANNEL COAL,
1500 Tons of Second-Class CANNEL COAL,
500 Tons of GAS SPLINT COALS or NUTS,

all free on rail on the Gas Company's Siding, Montrose.

Sealed Tenders, marked "Tenders for Coal," and giving Name, Analysis, and Quantity of Coal offered, to be lodged with the Subscriber not later than the 26th of March, 1901.

Thomas D. Hall,
Manager.

Gas-Works, Montrose,
March 11, 1901.

BOROUGH OF COLNE.
(Gas Department.)

THE Gas Committee invite Tenders for the surplus TAR made at their Works during the Twelve Months ending March 31, 1902.

Particulars may be obtained on application to the undersigned.

Sealed Tenders, endorsed "Tar," must be addressed to the Chairman of the Gas Committee, Gas-Works, Knott's Lane, Colne, Lancs., and delivered not later than Saturday, the 23rd day of March, 1901.

The highest or any Tender not necessarily accepted.

Fred Thorpe,
Engineer and Manager.

Gas-Works, Colne, Lancs.,
March 7, 1901.

BOROUGH OF LEIGH.
(Gas and Water Departments.)

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of FIRE-CLAY, RETORTS, and BRICKS.

Forms of Tender and further Particulars may be obtained on application to the Manager, Mr. John Foster, Gas-Works, Leigh.

Sealed Tenders, endorsed "Tender for Retorts, &c.," to be sent to the undersigned on or before Twelve o'clock noon, on Saturday, March 23, 1901.

By order,
(Signed) Peregrine Thomas,
Town Clerk.

Town Hall, Leigh, Lancs.,
March 6, 1901.

CITY OF LEEDS.
(Gas Department.)

TENDERS FOR DRY GAS-METERS.

THE Gas Committee of the Leeds Cor- poration are prepared to receive TENDERS for the supply of DRY GAS-METERS to be delivered at their Meter-Stores during a period of Twelve Months from receipt of order.

Each party tendering is required to send, on or before Monday, the 18th inst., two sample 3-light Meters (one of which is to be left open for examination), addressed to the Gas-Meter Works, Meadow Lane, Leeds.

Forms of Tender may be obtained on application to the undersigned, at the Offices of the Gas Department, Municipal Buildings, Leeds.

Endorsed Tenders, addressed to the Chairman of the Gas Committee at the latter address, will be received not later than Monday, the 25th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. Townsley,
General Manager.

Municipal Buildings, Leeds,
March 9, 1901.

THE Corporation of Middleton are pre- pared to receive TENDERS for the supply of SUNDRY STORES for One Year ending the 31st of March, 1902, consisting of the following: LIME, VITRIOL, METERS, BRASS MAIN COCKS, TUBES and FITTINGS, FIRE-CLAY GOODS, and the following VARIOUS GOODS:

Group 1—OILS (Gas-Engine, Cylinder, Engine, Boiled, Exhauster, Conveyor Lubricant, and Turpentine), SULPHATE OF AMMONIA BAGS, RETORT CEMENT, RED and WHITE LEAD, SPUN YARN, and TARRED YARN.

Group 2—WASTE and CLEANING CLOTHS, YARD BASS BROOMS, BUCKETS, SHOVELS, FILES, and COKE FORKS.

And also for the purchase of the surplus TAR made at their Gas-Works during the same period (about 700 Tons).

Further Particulars, Specifications, and probable Quantities may be obtained on application to Mr. T. Duxbury, Gas Engineer.

Tenders, addressed to the Chairman of the Gas, &c., Committee, and endorsed "Tender for ....," to be delivered at my Office on or before Wednesday, the 13th of March, 1901.

The Corporation do not bind themselves to accept the lowest or any Tender.

Frederick Entwistle,
Town Clerk.

Town Hall, Middleton,
Feb. 26, 1901.

BRITISH GASLIGHT COMPANY, LIMITED

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 20th inst., at Twelve o'clock precisely, to transact the usual Business, and to declare a Dividend for the Half Year ended the 31st of December last.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 9th and RE-OPENED on the 21st inst.

By order of the Court of Directors,
H. B. Chamberlain,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 1, 1901.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY GENERAL ASSEMBLY of the Proprietors will be held at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., on Thursday, the 28th of March, 1901, at Twelve o'clock noon precisely, pursuant to Act of Parliament.

The TRANSFER BOOKS in respect of the ORDINARY STOCK WILL BE CLOSED from the 21st of March inst. to the 10th of April inclusive, and RE-OPENED on the 11th of April, on which day the Dividends on this Stock will be payable.

By order,
I. A. Crookenden,
Secretary.

St. Helen's Place,
Bishopsgate Street, E.C., March 7, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards' Offices, 18, Finsbury Circus, E.C.

By order of the Directors of the

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

400 £10 SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 26, at Two o'clock, in Lots.

Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

STAINES RESERVOIRS JOINT COMMITTEE.

Incorporated by Act of Parliament, 59 and 60 Vict., Cap. 241.

ISSUE OF £200,000 £3 PER CENT. DEBENTURE STOCK.

Payment of Interest guaranteed by the three following Companies:—

WEST MIDDLESEX WATER-WORKS COMPANY,
GRAND JUNCTION WATER-WORKS COMPANY,
AND THE
NEW RIVER COMPANY, jointly and severally.

NOTICE is Hereby Given, that the Joint Committee are prepared to receive TENDERS for the above amount, being a further portion of the DEBENTURE STOCK created by the above Act, and by the Act of 1898, bearing Interest at £3 per cent. per annum, payable half yearly, and redeemable at par after the expiration of 25 Years from the date of issue, subject to Six Months' Notice being given by the Committee.

The Staines Reservoirs Act, 1898, authorizes Trustees to invest Trust Funds in this Stock.

Tenders must be delivered at the Office of the Committee, No. 19, Marylebone Road, N.W., not later than Two o'clock p.m., on Wednesday, the 20th of March next.

Particulars and Conditions, together with Form of Tender, may be obtained at the said Office, or will be forwarded on application; also of Messrs. Hollams, Sons, Coward, and Hawksley, Solicitors, 30, Mincing Lane, E.C.; and of Messrs. Prescott, Dimsdale, and Co., Limited, Bankers, 50, Cornhill, E.C.

By Order of the Joint Committee.

F. H. Wyboo,
Secretary.

Office of the Committee:
19, Marylebone Road, London, N.W.,
Feb. 20, 1901.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

IMPORTANT SALE OF FURTHER NEW ISSUE OF SHARES

In this Old-Established and good Dividend-Paying Company.

MESSRS. LOVE & COOPER are favoured with Instructions from the Directors of the above-named Company to SELL BY PUBLIC AUCTION, at their Sale Rooms, 14, Osborne Road, Southsea, on Tuesday, April 16, 1901, at Seven o'clock in the Evening—

The Sixth Portion of the New Issue authorized under "The Borough of Portsmouth Water Order, 1898,"

Consisting of

1500

SHARES OF £5 EACH (FULLY PAID),

FORMING PART OF THE NEW ORDINARY CAPITAL AUTHORIZED UNDER SUCH ORDER.

The Auctioneers desire to call the attention of Investors and Capitalists to this Important Sale, which provides a thoroughly well-secured and reliable Local Investment.

The foregoing Shares offer exceptional security to the holders; the Company possessing an abundant supply of Water, and supplying this rapidly increasing Borough with a constant service.

The Shares will be sold free of any Charges, Fees, or Expenses whatever to the Purchaser.

Full Particulars and Conditions of Sale may be obtained, with any further Information, from the Secretary of the Company, J. L. Wilkinson, Esq., at the Company's Offices, Commercial Road, Portsmouth; or of the Auctioneers, at their Offices, 14, Osborne Road, Southsea.

BOROUGH OF NELSON.

THE Gas Committee invite Tenders for the supply of BRASS FITTINGS and CAST-IRON PIPES and SPECIAL CONNECTIONS for Twelve Months.

Form of Tender, with Particulars, can be had on application to Mr. A. Allan, Gas Engineer, and Samples may be seen at the Gas-Works.

Sealed Tenders, endorsed "Brass Fittings," or "Cast-Iron Fittings," must be sent to me, the undersigned, not later than the 21st of March.

The lowest or any Tender will not necessarily be accepted.

R. M. PRESCOTT,
Town Clerk.

Town Hall, Nelson.
March 6, 1901.

Now Ready, Fcap. Fo'., 28 pp., 2 Plates, and 43 Illustrations, Bound in Duplex Paper Cover, Price 2s. 6d. net, post free.

A DESCRIPTION
OF THE
ZURICH NEW GAS-WORKS.
By A. WEISS, Engineer of the Works.

Translated from the German for, and Reprinted from, the "JOURNAL OF GAS LIGHTING," &c.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

Foolscap 4to, pp. 535, with 239 Illustrations and Steel Plate Engraving (as Frontispiece) of WILLIAM MURDOCH, *Inventor of Gas Lighting. Morocco Gilt, 21s.; Roan Gilt, 18s.*

THE SIXTH (AND CENTENARY) EDITION
OF THE
HANDBOOK
FOR
GAS ENGINEERS
AND MANAGERS.
BY
THOMAS NEWBIGGING,
M.Inst.C.E.

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WALTER KING, 11, BOLT COURT,
FLEET STREET, E.C.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

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AND
ALL PARTS FOR GAS & WATER METERS.
Quotations to Samples.
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Tourtel Manufacturing Co., Ltd.,
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Can undertake the Largest Contracts.

HYDRAULIC BLOWER
For blowing Air into Gas Purifiers for the purpose of
REVIVIFYING
THE FOULED OXIDE.
Full Particulars on application.
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NITRATE of Thorium and Cerium.
FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

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FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

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Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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SULPHURIC ACID.
GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.
Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.
Head Office: Miles Platting, MANCHESTER.
Inquiries Solicited.

JAMES OAKES & CO.
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., LD.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the
WEARDALE IRON & COAL Co., LD.
QUAYSIDE, NEWCASTLE-ON-TYNE.

HEBBURN MAIN GAS COALS.

Yield of Gas per Ton	10,500 Cubic Feet.
Illuminating Power	16·4 Candles.
Coke	68 per Cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
The Wallsend & Hebburn Coal Company, Ltd.
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

BOLDON GAS COALS.

Yield of Gas per Ton	10,500 Cubic Feet.
Illuminating Power	16·9 Candles.
Coke	66·7 Coke.
Sulphur	0·86 Sulphur.
Ash	2·04 Ash.

As per Analysis by
Mr. JOHN PATTINSON, F.I.C., F.C.S.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

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SHEAF WORKS, SHEFFIELD,
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STEEL OF ALL DESCRIPTIONS.
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SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
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FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees
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HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.

CHESTERFIELD.

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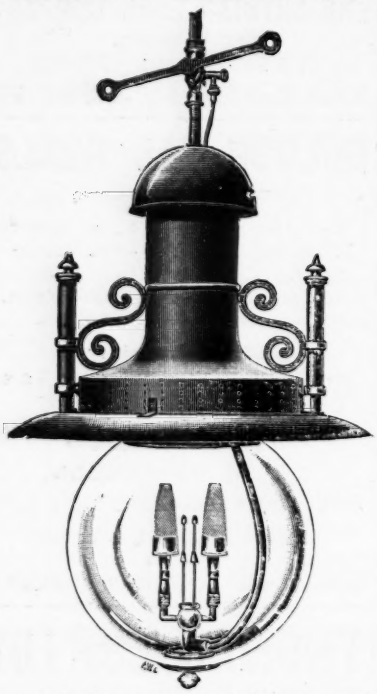
"BEACON" GLOBE LAMP.



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per 7/6 Doz.

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80, Commercial Road, London, E.

INCANDESCENT

HOLMSIDE GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16$\frac{7}{10}$ Stand. Sperm Candl.
Coke (of good & pure quality)	13$\frac{3}{4}$ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

Present Daily Produce available 3000 Tons

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

KAVENSTHORPE, NEAR DEWSBURY.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton . . .	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·83 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE, SON, & HUNTER,

COAL OWNERS, NEWCASTLE-ON-TYNE;

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E. FOSTER & CO.,

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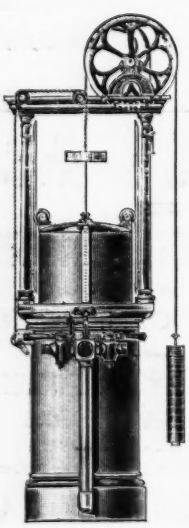

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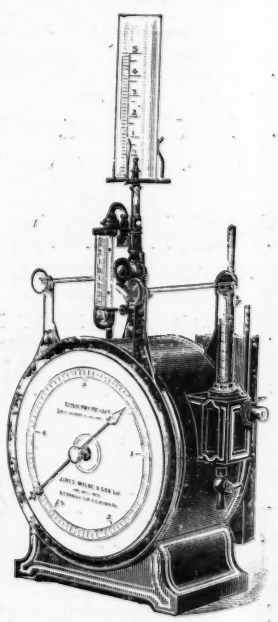

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INCLINED, REGENERATIVE, GENERATIVE, AND FLOOR LINE.

SEVERAL THOUSANDS OF OUR SETTINGS IN SUCCESSFUL WORK.

Plans, Estimates, and full Particulars for Complete or Partial Erection and Renewals.

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ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS SHEFFIELD."

MOBBERLEY & PERRY STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

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GANDY BELT M'F'G. CO., LD.
Works: SEACOMBE, CHESHIRE.
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Don't be Misled!
40 Awards!!
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WE MAKE A SPECIALITY OF ENDLESS BELTS FOR BLOWERS.

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GAS SERVICE CLEANSERS.
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SUITABLE FOR WORKS OF EVERY CAPACITY,

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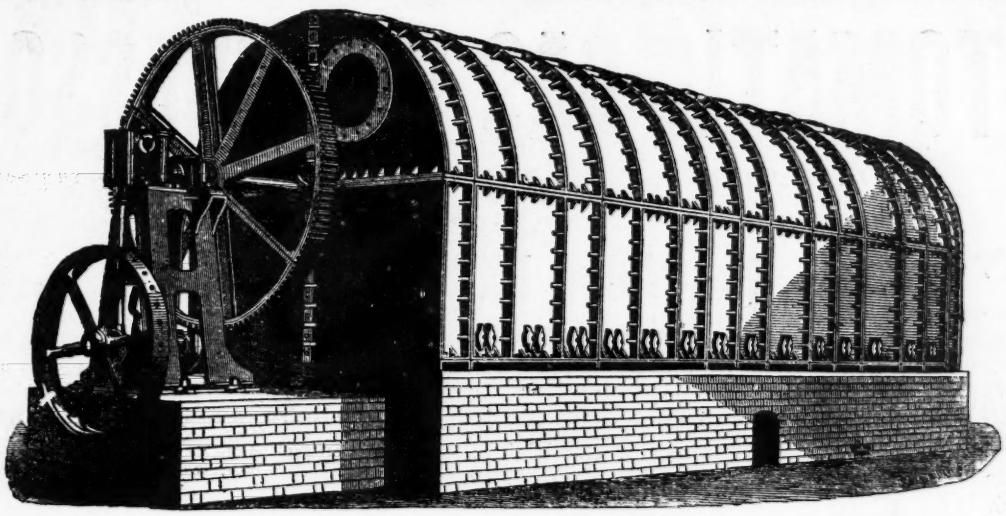
SCRUBBERS, PURIFIERS, VALVES, &c.

DESIGNS AND ESTIMATES ON APPLICATION.

H. KIRKHAM'S PATENT "IMPERIAL" WASHER-SCRUBBER.



TESTIMONIALS.

The Dover Gaslight Company,
Gas-Works, Buckland,
Dover, Feb. 8, 1899.

H. KIRKHAM, Esq.,

Dear Sir,—Have now made further tests with the Washer fitted with your PATENT WASHING DEVICES, and have much pleasure in reporting that *the results were highly satisfactory*; also, I ascertained that the maximum results were obtained when the machine was working at three revolutions per minute. At this speed 13 to 14 gallons of water per ton of coal carbonized were converted into 10-oz. Ammoniacal Liquor, and at same time the Gas was free from Ammonia.

Should you wish further details, I will forward them.

I am, dear Sir, yours truly,
RAPHAEL HERRING, Engineer.

The Dover Gaslight Company,
Gas-Works, Buckland,
Dover, April 4, 1900.

Re H. KIRKHAM'S PATENT WASHER.

Please note I have much pleasure in stating that one of the above Patent Washers, 1,000,000 cubic feet capacity per 24 hours, has now been in regular action day and night for about 18 months, and is still working to our entire satisfaction.

Six months ago I examined the interior, and then found the Scrolls clean and bright, due, in my opinion, to the flushing action of the fluid rushing from inside the Scrolls.

Also when passing its maximum quantity of gas it gives the minimum of pressure.

For further Particulars see my report to Mr. H. Kirkham, Feb. 8, 1899.

Yours truly,
RAPHAEL HERRING, Engineer.

The Dover Gaslight Company,
Gas-Works, Buckland,
Dover, Dec. 29, 1900.

H. KIRKHAM, Esq.,

DEAR SIR,—Your Washer fitted with Patent Scroll Devices was put to work Nov. 9, 1898, and has been in regular use to this date.

I am sure you will be pleased to know that the excellent results we got when this was first started are still regularly obtained.

Yours truly,
RAPHAEL HERRING.

EFFICIENCY GUARANTEED.

Estimates given for a complete set of Segments for One Wheel, or for refitting the whole number of Wheels in a Machine; also for Washer-Scrubbers complete.

Office: 335, MANSION HOUSE CHAMBERS, QUEEN VICTORIA STREET, LONDON, E.C.

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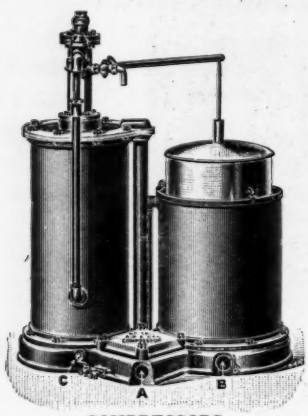
AUTOMATIC GAS COMPRESSORS

FOR HIGH-PRESSURE INCANDESCENT LIGHTING.



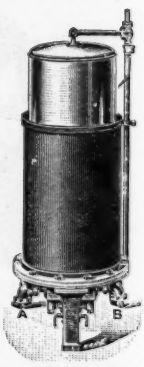
COMPRESSORS
FOR WORKING WITH OR
WITHOUT WATER POWER.

GLASGOW EXHIBITION, 1901.

Two of this Company's largest Compressors, capable of supplying 12,000 cubic feet of Gas per Hour, have been selected for giving the necessary pressure for the High-Pressure Lighting Installation in the grounds of the above.

Full Particulars and Prices upon Application.

Beware of Unscrupulous Imitations.



CAPACITY
50 to 6000 Feet of Gas
per Hour.

Plants of any magnitude designed for automatically increasing Gas Pressure in Low-Lying Districts.

THE WATER MOTOR & AUTOMATIC LIQUID ELEVATOR COMPANY, Ltd.,

27, FARRINGDON AVENUE, and 59, FARRINGDON STREET, LONDON, E.C.

ELEVATORS AND CONVEYORS

We have for many years made a speciality of Coal and Coke Handling Machinery, and have recently, at great Cost, installed New Plant for more rapid and economic production.

ORDERS ON HAND include the complete equipment of several of the largest **Retort-Houses** in the **United Kingdom**, with our **Automatic Coal and Coke Breaking, Elevating, and Conveying Appliances.**

Telegrams:
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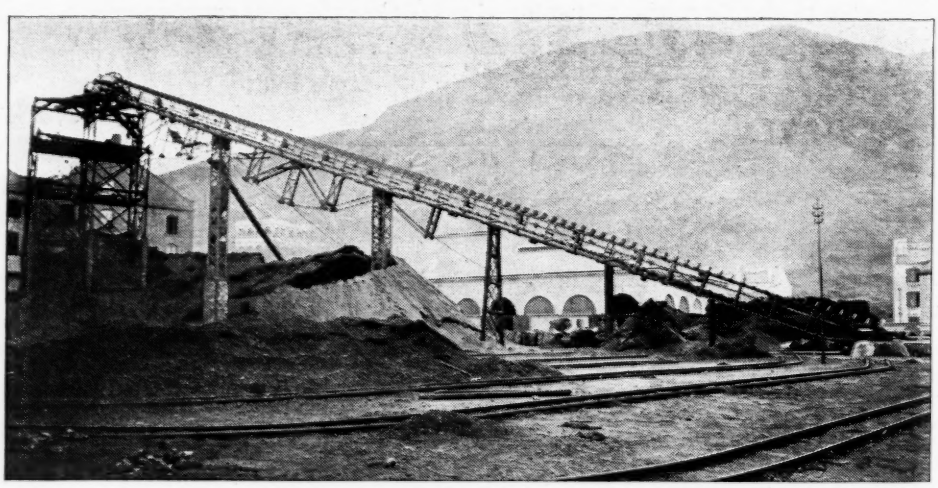

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Head Office:
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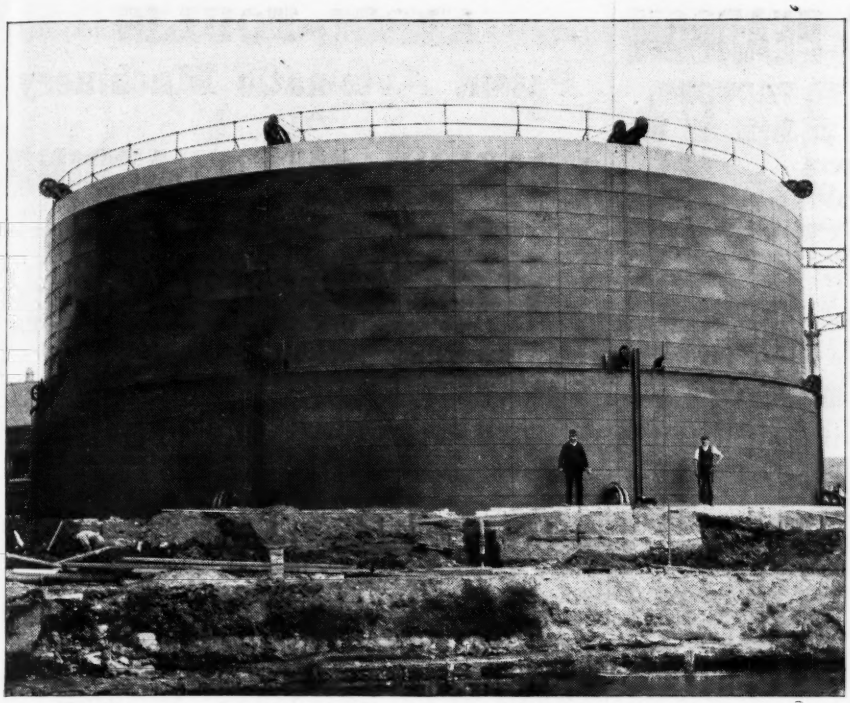
Inclined Coal-Conveyor—Capacity 200 tons per hour.

BLAKE, BARCLAY, & CO., VICTORIA WORKS, GREENOCK.



Two-Lift Cable-Guided Gasholder, 80 ft. diameter by 20 ft. deep.
STAFFORD CORPORATION GAS-WORKS. (*From a Photo.*)

COPY OF TESTIMONIAL.

CORPORATION OF STAFFORD,
GAS & ELECTRICITY DEPARTMENT,
STAFFORD, *Feb.* 9, 1899.

Messrs.
ASHMORE, BENSON, PEASE, & CO., LTD.,
Stockton-on-Tees.

GENTLEMEN,

It affords me pleasure to state that our No. 2 Gasholder, from which you removed the outside Guide-Framing on account of it being defective due to the settlement of the foundations, and substituted your Steel-Wire Cable System for both Inner and Outer Lifts, has, since the alteration, **worked perfectly satisfactory.**

Its Stability and Rigidity under High Wind Pressures, when fully inflated, is such that **it preserves the level working of both Lifts, and gives a steady outlet pressure.**

I am, sincerely yours,
JNO. FERGUSON BELL,
Engineer.

PATENTEES AND MANUFACTURERS:

ASHMORE, BENSON, PEASE, & CO., LTD.,

STOCKTON-ON-TEES.

ESTABLISHED 1844. **ORIGINAL MAKERS.** ESTABLISHED 1844.

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

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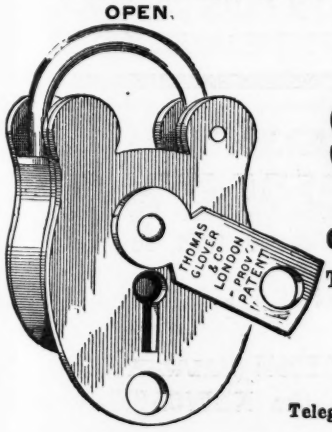

THOMAS GLOVER & CO.'S

PATENT

SECURE PADLOCK

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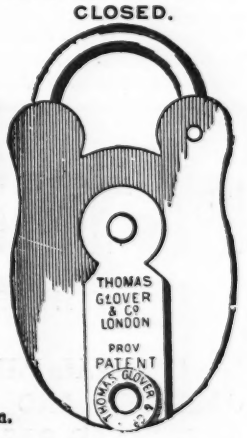

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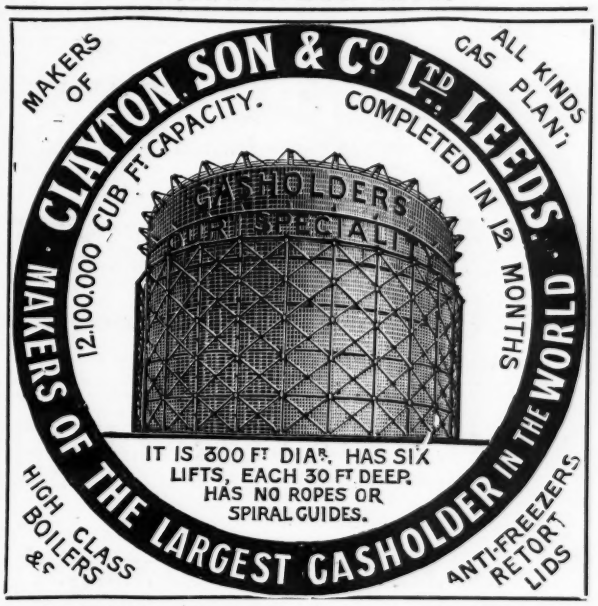
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